ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXIII. No. 3429 AUGUST 13, 1943 6d. WEEKLY

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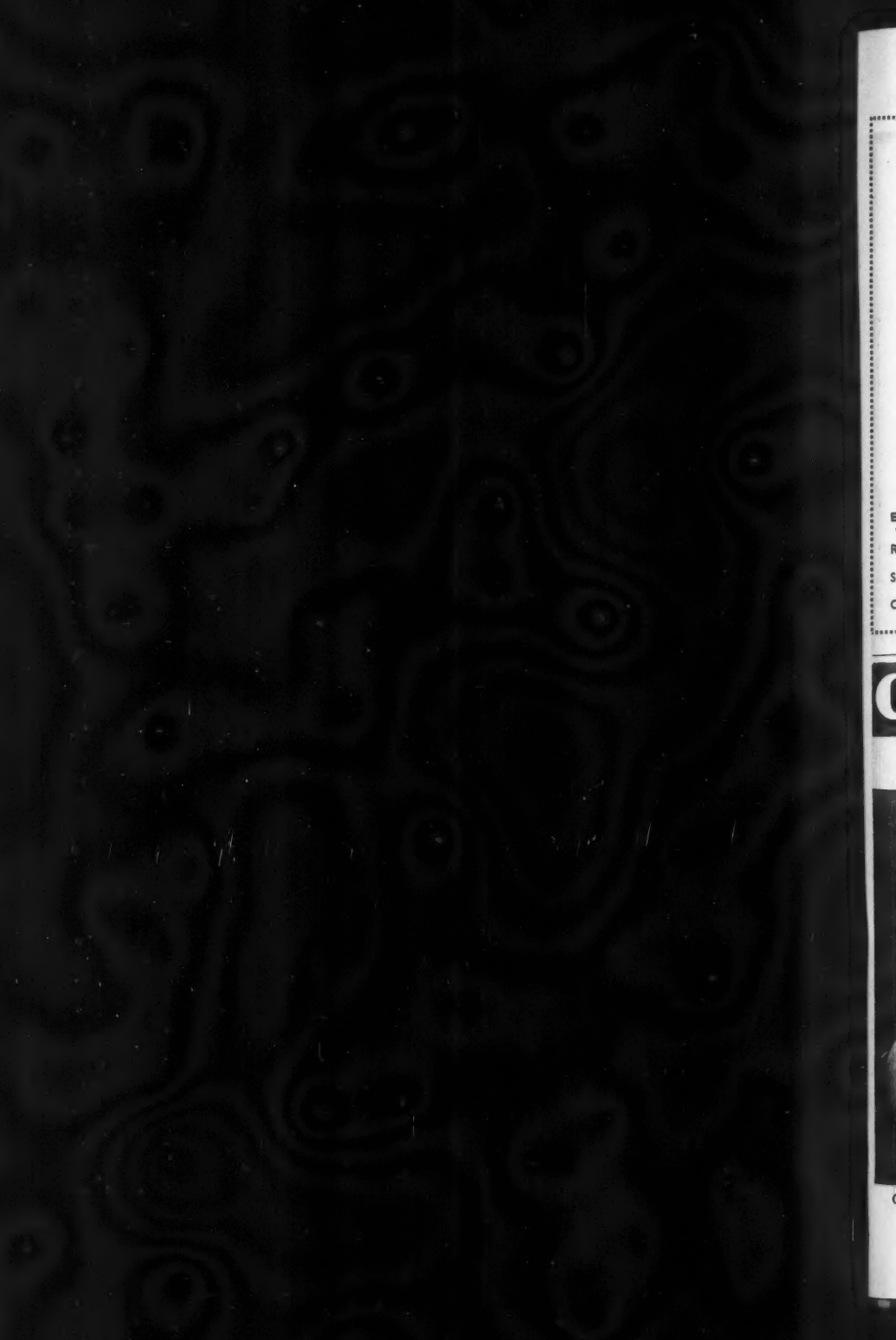

ELECTRICAL REVIEW

August 13, 1943

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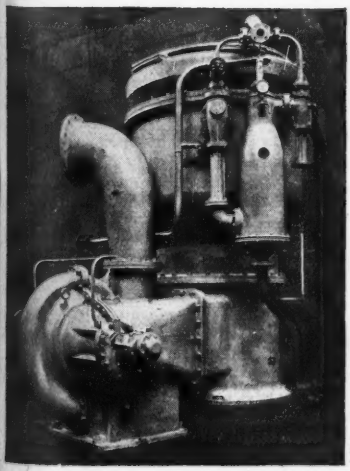

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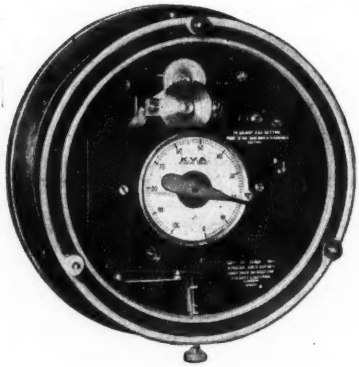

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIII. No. 3429. AUGUST 13, 1943 6d. WEEKLY

Meeting the Demand

Equipment of Post-War Houses

IN last week's issue reference was made to the immense possibilities which lay before the electrical industry. It is not to be expected, however, that the realisation of these possibilities will come about by natural means. No doubt a large section of the public, of its own accord, will demand electricity and electrical appliances, but the rest will have to be approached by the industry on realistic lines.

Plans are being prepared by the Electrical Development Association to resume on a large scale its various activities designed to make the British people electrically minded and wartime experience will prove a useful ally. But however favourably disposed towards electricity the public may be it will demand service at a reasonable price—by which is meant at a price comparable with that at which alternatives are available.

Adequate Installations

It may be taken for granted that all new houses will be wired for electricity and we must strive to ensure that when this is being done installations are adequate for full electrical service. We think that an ample supply of power at favourable rates will be generally available. The question of equipment remains.

Before the war there was a widely-held view that electrical appliances were too expensive. While this was not entirely true, having regard to the nature of these appliances, there was certainly scope for, and a possibility of, cheaper products. Many people, including manufacturers themselves, felt that by a greater economy of material, a certain measure of standardisation and simplification of construction, and less elaborate finish and " trimmings," there could be a substantial reduction in costs and prices.

Standardisation of dimensions and components particularly was thought to be very desirable, mainly from the service point of view, and endeavours were made to secure this. A notable example was the " I.M.E.A. " standard cooker which was evolved some years ago, but for various reasons was not far proceeded with.

Economy through Standardisation

The war has brought a very definite break in production. This has been generally deplored, but it may be regarded as a good opportunity for a fresh start. One potent factor will force manufacturers to adopt the utmost economy in construction—the shortage of materials which is likely to extend far beyond the war period. Standardisation of essential parts will no doubt assist in securing this economy and we are glad to see that serious attention is now being paid to this matter.

The principal handicap encountered in the past was the difficulty of reconciling the views of a large number of customers. The latter term does not necessarily mean the public, which, after all, generally takes what it is offered, within reason. Much of the responsibility rests upon the electricity

supply authorities, who have frequently been individualist and hard to please. We believe the manufacturers would be willing to get together in the production of standard appliances if they could surmount this obstacle. For this reason it is satisfactory to learn of the appointment of Mr. E. E. Hoadley, of Maidstone, to act as a liaison officer between the two parties. Mr. Hoadley is, we believe, *persona grata* with both the supply authorities, with which he has a most intimate acquaintance, and the manufacturers, who are anxious to do their best for their customers. It is evident that there is a determination to deal seriously and swiftly with this subject, and we look forward to early results.

Line of Action

COOKERS will be the first and principal study in these "efforts to satisfy the public demand for electrical equipment in the post-war housing programme," as B.E.A.M.A. puts it in announcing Mr. Hoadley's appointment. Washing machines and refrigerators will also receive consideration. The washing machine has hitherto been quite out of the reach of the majority of consumers and has consequently been neglected by the supply authorities. The refrigerator has been described as a necessity, not a luxury, but desirable though it may be it is not indispensable in this country's climate, although it may be thought heretical to say so. But luxuries do become "necessities" when they obtain a firm hold. In this connection there is the stimulus of very active gas competition.

Retailers' Future

ELECTRICAL retailers, after reading the foregoing, may wonder where they come in. Already most of the cooker business had been taken by the electricity supply authorities with their showrooms and hire and hire-purchase schemes. In sales of the smaller equipment departmental stores and miscellaneous traders had made great inroads. Remunerative business was done in refrigerators and washing machines, but the volume of sales was not large enough to keep them all going. The subject is far too large to dismiss in a few words, but future hope for electrical retailers seems to lie in a general stimulation of public interest in electrical matters to be met by greater co-operation between the many individual concerns. If supply authorities confine their attention to a few standard appliances there will still be a demand for a great deal of other equipment which will have to be satisfied.

South Shields Case

THE House of Lords judgment in favour of the South Shields Corporation, reported in this issue, concludes a case of interest to a number of municipal authorities. The principal point raised was whether a local authority which had established a common fund by virtue of powers conferred by special Private Acts could regard payments in and out of it as a whole for income tax purposes or whether each trading undertaking contributing to the fund must be treated as a separate entity. Mr. Justice Lawrence in the original action ruled that the latter course was the correct one, but on the appeal of the Corporation this judgment was reversed and the Court of Appeal's decision has now been upheld.

Electrical Jubilees

THE early 'eighties saw the initiation of public supply schemes in a number of towns, and among those whose Jubilee falls this year are Huddersfield and Manchester. True to county tradition, they were close rivals in getting off the mark, the Yorkshire town being first by two days. Such a venture was then regarded with some trepidation and it is recorded that the Huddersfield enterprise met with considerable local opposition at the outset. One councillor is reported to have expressed the hope, at the inaugural ceremony, that they would be able to hold their own without having to be subsidised every year!

Red Cross Fund

THE latest list of subscriptions to the Electrical Industries Red Cross Fund brings the total received so far to £16,649. Of this £10,430 is in the form of covenants and is thus a recurring figure so long as the war lasts. This is a very useful amount but it can hardly be considered commensurate with the magnitude of the electrical industries. It is realised that the appeal was made after most concerns had arranged to do something for the Red Cross, but even so it would be a grand thing for them to support the industries' special endeavour.

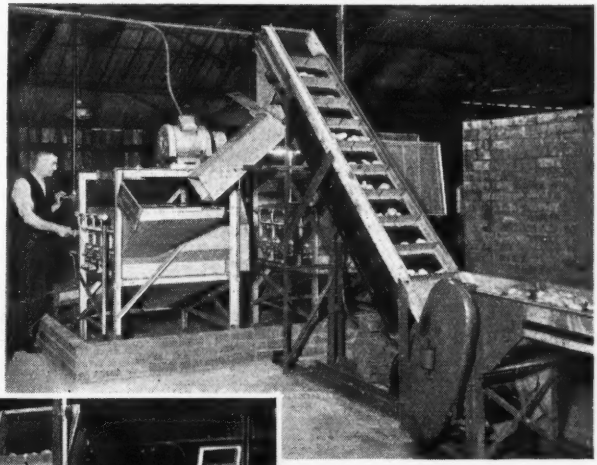
Food Dehydration

Severe Operating Conditions for Electric Motors

THE dehydration of foodstuffs has now passed out of its experimental stages and several of the thirty or so plants which the Ministry of Food at present plans to erect are now in full production. These are intended exclusively to deal with the needs of the Forces serving overseas for vegetables which are thus supplied in a highly concentrated and easily portable form, a four-gallon container holding the equivalent of 100 lb. of fresh cabbage or potato and half as much again of carrots. When reconstituted the vegetables are practically indistinguishable from the fresh foodstuff, both in appearance and taste, as well as being of first-class food value with high vitamin content.

As indicated, the vegetables most commonly handled at present are potatoes, carrots and cabbages, but the process is equally suitable for other vegetables as well as fruits. While there is not likely to be a large post-war demand for installations to treat the above-mentioned vegetables, there is a promising future for preserving seasonal crops with normally poor storing qualities. The "life" of the dehydrated product is claimed to be two years in temperate climates.

A few days ago we had an opportunity to inspect one of the latest plants to see what an important part electricity plays in the process. The whole of the machinery is electrically



Conveyor feeding continuous potato peeler, and (left) the potato pre-washing plant and loading hopper

operated and controlled, and as might be imagined the conditions under which the electric motors and control gear have to operate are exceptionally severe, since there are inevitably considerable quantities of "loose" water, steam, abrasive grit, etc., as well as high humidity and unsteady load to cope with. Enclosed type motors are therefore employed wherever possible. Steam is used for the heating processes, though we understand that in Switzerland, where hydro-electric power is plentiful, electricity has been utilised for the purpose.

Throughout the factory as much of the work as possible is

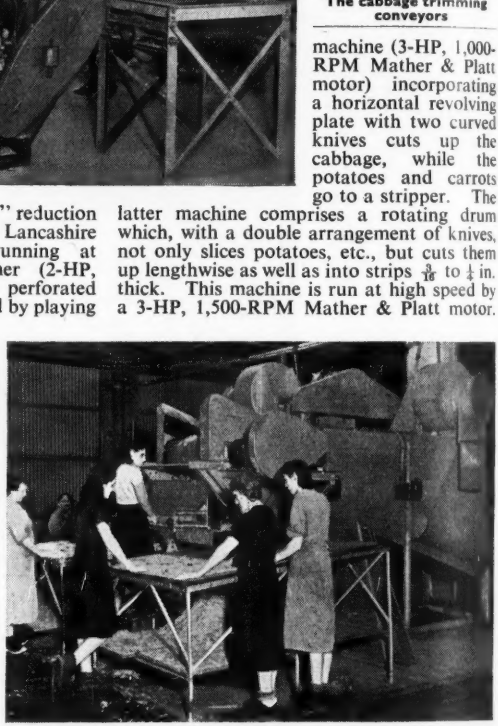
done mechanically. The potatoes and carrots are first tipped into a hopper from which they are fed to a pre-washer by an elevator. This, like the other elevators referred to later, is driven through " Radicon " reduction gearing by means of a 1-HP Lancashire Dynamo & Crypto motor running at 940 RPM. In the pre-washer (2-HP, 940-RPM motor), a revolving perforated cylinder, the vegetables are washed by playing vertical jets of water on to them as they travel along inside. Diseased roots, stones, etc., are then picked out by hand on a travelling inspection belt. The motor which operates this through a Renold drive is also employed to work an elevator which links the inspection belt with two continuous peelers arranged in duplicate.

The cabbage trimming conveyors

The potatoes or carrots are fed into chutes at the tops of these machines and pass over four sets of four carborundum-faced ceramic rollers arranged to have an oscillating as well as a rotating motion. The 7½-HP, 1,440-RPM motors mounted above drive the rollers through V-belts. These preliminary processes completed, the peeled potatoes and carrots follow the same course as the cabbages, the vegetables first going on to a main belt conveyor and then on to one of three subsidiary belts where trimming of the cabbages, removal of the eyes and odd bits of skin from the potatoes, etc., and final inspection take place. To give an idea of the speed of this process, fifty to seventy lb. of potatoes can be handled by an operator in an hour.

After final inspection the vegetables go either—in the case of cabbages—to a coring machine (made by Mather & Platt and driven by a 2-HP, 1,000-RPM motor) or straight to a belt which in its turn feeds either an elevator leading to the processing line or to a buffer store. The latter permits the processing plant to operate for three shifts while the preparation side works only two.

A shredding machine (3-HP, 1,000-RPM Mather & Platt motor) incorporating a horizontal revolving plate with two curved knives cuts up the cabbage, while the potatoes and carrots go to a stripper. The latter machine comprises a rotating drum which, with a double arrangement of knives, not only slices potatoes, etc., but cuts them up lengthwise as well as into strips $\frac{3}{16}$ to $\frac{1}{4}$ in. thick. This machine is run at high speed by a 3-HP, 1,500-RPM Mather & Platt motor.



Loading the trays as the material leaves the air cooler

The vegetables in the buffer store are kept in water and to pump the water required in these tanks there is a pump driven by another 3-HP, 1,500-RPM motor.

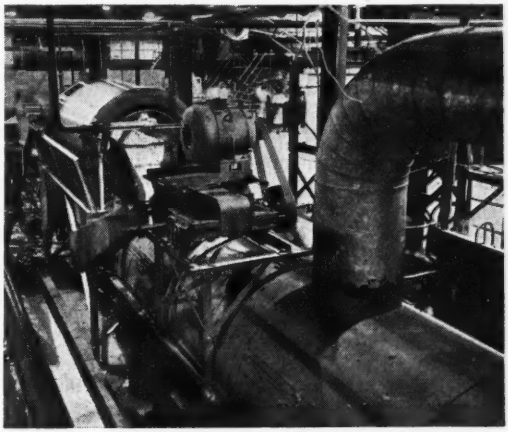
A thorough cleaning for about two minutes in a strip washer (a rotating perforated cylinder) then removes any dirt or other foreign matter, a scroll conveyor delivering the contents to a scalder or blancher. The purpose of this apparatus, the key to the

success of the whole process, is to inactivate the enzymes and ensure a good product with a long storage life and to preserve the vitamins and flavour. The plant is similar in appearance and design to the strip washer, but is arranged for boiling water, to which a small amount of sodium sulphite has been added, to scald the vegetables for two or three minutes, temperature control being effected automatically by means of air valves.

The pH is controlled within very accurate limits by the addition of acid or sodium carbonate. At present a Cambridge pH indicator is being employed, but it is proposed later to install an instrument which will automatically open valves and admit the acid or sodium carbonate. The vapour is extracted by means of an electric fan (1-HP, 960-RPM motor) to atmosphere.

As the operation of the system depends on a steady flow of process material it has not been thought necessary to have all the apparatus equipped for variable speed. In the case of the scalder and strip washer, however, control of the time of treatment is provided for by means of a cone and belt type gear box connected to 3-HP, 960-RPM motors.

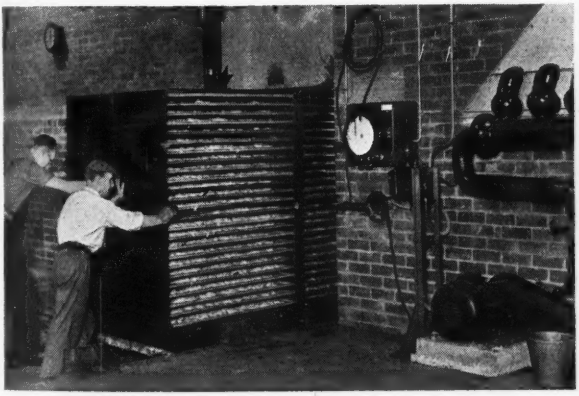
Leaving the scalder the vegetables are treated in an air cooler in which two fans (3-HP, 960-RPM motors) blow a current of cool air up through the perforated metal conveyor. This stops further scalding, drives off excess water and renders the material cool enough to handle. The material is then placed by hand on to wire mesh trays which are placed on to trucks, holding twenty-five trays in each half section, ready for the dehydration process proper. This is carried out in a continuous dehydration tunnel large enough to hold a maximum of twelve pairs of trolleys, one pair being admitted and another removed every twenty-five minutes; an automatic pusher is employed to move the trolleys along.



The scalder, showing variable speed drive and strip washer in the background

In this tunnel the drying process is effected in two stages. In the first stage of the drying process the air travels in the same direction as the trucks, the inlet air temperature being 200 deg. F. Due to the removal of moisture the temperature at the exit end of this first half of the tunnel falls to about 150 deg. F.

At the end of this stage of the process the trucks are removed from the end of the tunnel and pass back through the second section of the tunnel, running parallel with the first section. This time, however, in order that the temperature at the end of the process may be as high as possible so as to reduce the moisture content to 5–7 per cent., the current of



Loading trolleys into the "wet" section of the dehydration tunnel

air is arranged to flow in the opposite direction to that of the trucks. In this case the temperature of the air admitted is fixed at the highest possible level at which the material does not burn or scorch, namely about 150 deg. F. Recirculation of air is employed in both sections of the dryer. Fresh air is drawn into the dry section only and exhaust is from the wet section. The necessary make-up for the wet section is drawn in from the dry section recirculation duct. Gilled tube steam heaters are used. Control of the various air flows is effected by a series of louvre dampers.

The fans for the wet and dry sections of the tunnel are driven through V ropes by respectively 50- and 20-HP Mather & Platt motors running at 1,000 RPM. For these motors Allen West push-button starters are employed, but elsewhere in the establishment the control units are of Crabtree construction.

Final Processes

When it is cooled the dehydrated product is weighed by hand and placed in standard 4-gal. tins. In addition to pressed-on lids these have "tagger" plates soldered on to

Soldering "tagger" plates on to the tops of the filled tins

make them completely airtight. For this purpose "Stanelco" carbon-electrode type soldering irons are used.

Following this operation the tins pass to a gas-packing cabinet in which the air is exhausted and nitrogen introduced, this ensuring much greater storage life. The punctures made in this process are soldered up by means of small soldering irons of normal type which are also employed for closing the final holes after testing for leaks in a water tank. The bare metal parts of the tins are lacquered before dispatch.

Red Cross Appeal

Thirteenth List of Subscriptions

SINCE the last list was published a further twenty-four subscribers have responded to the Electrical Industries Red Cross Appeal raising the total received up to date to £16,649; their names are given in the appended list (the thirteenth). Once again the list is representative of all branches—electricity supply authorities, manufacturers, wholesalers and retailers, including a number of radio concerns.

Information regarding the fund can be obtained from the organisers at 2, Savoy Hill, W.C.2, but subscriptions should be sent to the Red Cross and St. John War Organisation, St. James's Palace, London, S.W.1, with an indication that they are intended for the Electrical Industries Red Cross Fund.

Covenants

	Gross Annual Amount £ s. d.
Brought forward ..	10,355 4 0
Stalybridge, Hyde, Mossley & Dukinfield Transport & Electricity Board	20 0 0
Priestley & Ford, Ltd. ..	10 10 0
George Garton & Son, Ltd. ..	10 0 0
H. F. Truman Trading Co. ..	6 6 0
Central Electric Co.	5 0 0
John Naylor & Sons	5 0 0
Jack Ellison	5 0 0
Cosh & Hammond	5 0 0
Hobson & Scott, Ltd. ..	4 4 0
James Holmes	2 2 0
G. H. Williams	2 0 0
Total	£10,430 6 0

Donations

	£ s. d.
Brought forward	6,161 5 6
Gem Mill (Ferranti, Ltd.) ..	14 0 0
Devereux, Moodie & Co. ..	5 5 0
Hallamshire Electric Co., Ltd.	5 5 0
Gray Bros. Newcastle, Ltd. ..	5 5 0
Tom F. Pitts	5 0 0
H. J. & A. Wright, Ltd. ..	5 0 0
Ultra Electric, Ltd.	4 6 0
Acme Electrical Mfg. Co. ..	4 5 3
Farnworth Electricity Dept. ..	2 2 0
Pulver & Co., Ltd.	2 2 0
Wall & Atwooll, Ltd.	2 2 0
E.M.F. (Electrical), Ltd. ..	1 10 6
Eagle Electrical Eng. Co. ..	1 1 0
Total	£6,218 9 3

Defective Motor Starting

Some Causes of Failures

By "Rotor"

THE failures of motor starters described below, which were mainly due to faulty installation, maintenance or accident, have been brought to my notice during the past few years.

The stator windings of a 10-HP squirrel-cage motor driving an elevator were burnt out. Prior to the failure, the operator had experienced trouble in getting the auto-transformer starter to remain in the full-on position. Apparently the heavy current passed repeatedly during attempted starting was responsible for the failure.

The cotter pin used to secure the starter handle to the spindle was found to be loose, which resulted in a slight amount of lost motion due to the play between the handle and spindle. In consequence, the handle reached its stop before the mechanism had moved far enough to engage with the no-volt catch, unless it was moved rapidly enough to enable the mechanism to travel the last portion under its own momentum. The trouble was cured by driving the cotter pin home and tightening its securing nut. This instance illustrates how a small adjustment could have avoided a comparatively large breakdown, had the trouble been brought to the notice of the maintenance staff in time.

A somewhat similar trouble, which fortunately was discovered before any serious damage resulted, occurred due to the pivot of the hold-on catch in a star-delta starter being bent so that the catch frequently failed to engage in the full-on or delta position. The origin was in unnecessarily heavy blows received by the stop knob when the motor was stopped, the excessive force being transmitted through the catch to its pivot pin.

The windings of a three-phase motor were burnt out due to one of the moving contacts of the air-break star-delta starter having worked loose on its spindle so that the contact failed to "make." This resulted in the open-circuiting of one phase and excessive current through the delta-connected stator windings.

A 10-HP squirrel-cage motor, controlled by an air-break star-delta starter, was used to drive a fan. The free ends of the directly heated bi-metal overload elements of the starter were burnt, probably due to the operator not allowing the motor to reach a steady speed in the star position, so that an excessive current flowed during the second starting stage.

After new bi-metal strips had been fitted the starter tripped out as soon as it was moved to the star position and the motor could not be used. The cause was due to one of the bi-metal strips having been fitted in the reverse direction. The three bi-metal strips formed part of a device intended to trip the starter in the event of single-phasing resulting from an open circuit in one line. Hinged insulated trip bars were held in contact with the top and bottom of the strips by means of a light spring as shown in fig. 1. Trip contacts, connected in the no-volt coil circuit, were separated when the trip bars moved apart by a certain amount owing to unequal current in the strips. On account of the reversed strip, expansion resulting from the passage of the starting current caused immediate separation of the trip bars.

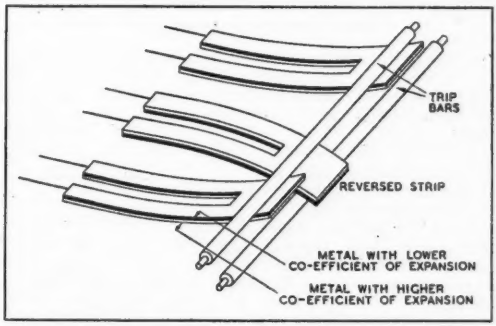


Fig. 1.—Effect of reversed bi-metal overload element of starter

When starting a 15-HP DC shunt motor driving machine tools through a countershaft, the armature failed to turn until the starter handle was moved over a few studs, and continued movement of the handle caused the fuses to melt. Tests on the starter in position failed to disclose any defect. It was seen on dismantling that the connection to the no-volt coil had broken away from the field contact stud and had caught on one of the starting resistances.

With the starter on the first stud the no-volt coil and shunt-field windings were receiving less than normal current owing to the voltage drop across the starting resistance

units C to D, shown in fig. 2. The reduced magnetic - field strength and consequent reduction of motor torque prevented starting until the starter had been moved partly over when, owing to reduced back EMF,

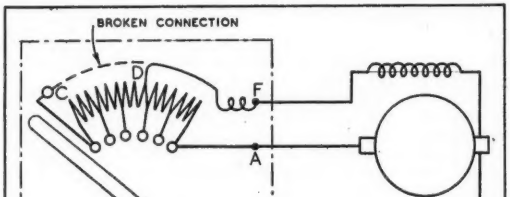


Fig. 2.—Effect of broken connection in DC starter

the current was excessive. Fortunately, the motor and the starter resistance had not suffered and normal starting was restored by reconnecting the lead to the shunt-field stud.

A 12-HP compound DC motor, used to drive a grinding mill, had an emergency stop button to control the no-volt trip of the starter. On one occasion when the button was pressed, the motor instead of stopping ran at increased speed until the fuses melted.

Investigation showed that the push button, instead of being a normally open one and connected across the no-volt coil, was actually a normally closed one and connected in series with the no-volt coil and shunt-field windings, as shown in fig. 3. When the button was pressed the no-volt coil and the shunt windings were both de-energised and the resultant arcing had damaged the button contacts. On the occasion in question the starter had stuck in the running position and, as the button was held in, the motor ran up to a higher speed as a series motor. Small brass pins were then fitted in the face of the no-volt magnet to prevent intimate contact with the iron armature on the starter arm so that it could not be held when the no-volt coil was de-energised—a rather common trouble with many DC starters.

AC contactors are also liable to remain closed when the coil is de-energised. This may cause a motor to restart itself when supply is resumed after an interruption, involving risk to personnel. It will also interfere with the operation of remote or emergency electrical controls, often preventing overload trips from opening the starter, since these are frequently designed to open the no-volt coil circuit. This trouble is usually due to dirt or oil between the fixed core and armature or plunger, where it causes an air lock sufficient to retain the latter in position. Sometimes the cases of push-button-controlled starters have been broken by an operator trying to shake the starter off after it has failed to respond to the stop button.

Burnt or rough contacts, strained mechanism or dry bearing surfaces may also be responsible for a starter holding on when the no-volt coil is de-energised. It is, therefore, advisable to test the no-volt trip occasionally. This may be done by pressing a remote stop button, where fitted, opening any auxiliary overload trip contacts, or by switching off at the main switch, preferably when the motor is running light. Electrically operated push-button starters are, of course, tested each time the motor is stopped.

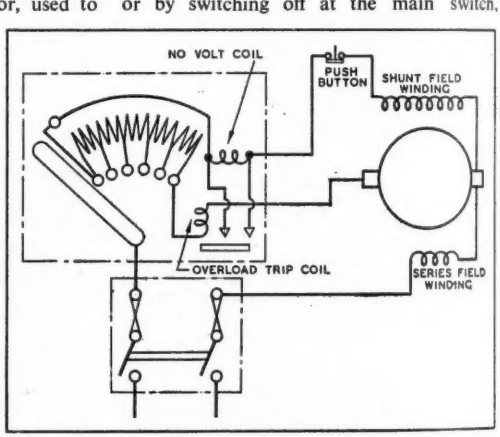


Fig. 3.—Incorrect connection of emergency stop button used with DC motor

Dirt on the core of an AC contactor prevented a slip-ring motor being used

on its lower speed ranges. This motor had an automatic starter controlled by push buttons on the driven printing machine. A section of the rotor resistance was cut out during starting by a contactor which normally opened again after the motor had speeded up. Tappings on the rotor resistance were taken to a hand-controlled speed regulator, a portion of which was found to have been permanently short-circuited by the sticking contactor.

AC contactors may overheat due to the contacts or other parts being so adjusted that the coil cannot pull the armature right up to its core. As a result the air gap in the iron circuit reduces the reactance of the coil, causing an excessive current to pass through it. Noisy operation may follow and this may also occur due to dirt preventing intimate contact between the armature and core. Chattering of the contacts, which is sometimes so severe as to cause them to be released, may be due to fracture of the copper short-circuiting band encircling a section of the core face of an AC contactor.

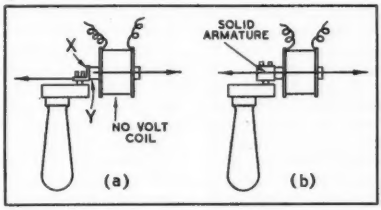


Fig. 4.—Modification of no-volt armature in DC starter

The starter of a DC motor frequently failed to remain in the running position. As shown in fig. 4 (*a*), the armature, X, on the starter arm was of L section and, due to its being loosely secured to the starter arm by a screw, the two opposing forces of the no-volt magnet and the spring acting on the arm were not in line. The resulting couple caused the armature to tilt on its screw; an air gap occurred at Y between the magnet and armature which reduced the magnetic effect, and consequently the armature was released.

The trouble was overcome by fitting a solid iron armature, as in fig. 4(b), the increased cross-section then giving increased magnetism for the same coil current, whilst the screw passing through the armature caused the forces to act in line and eliminated the tilting couple.

Some types of solenoid-operated motor starters are controlled by a time-lag air dashpot, so the plunger moves gradually to cut out the starting resistance. The leather washer on the dashpot piston is liable to get dry in time and to stick so that the plunger cannot complete its stroke. In this event a section of the resistance is left in circuit and may burn out, if rated to carry current during the starting period only. In addition, completion of the stroke on a DC starter frequently opens a pair of contacts which connect a resistance in circuit with the solenoid coil, the coil requiring less current to retain the plunger at the top than that necessary to move it from the bottom of its stroke.

In these circumstances sticking of the plunger is liable to cause burning out of the coil, since this carries maximum current all the time the motor is running.

PARLIAMENTARY NEWS

By Our Special Reporter

Water Power in Scotland

ON August 5th the Royal Assent was given to the Hydro-Electric Development (Scotland) Act.

On the same day Major Lloyd asked the Secretary of State for Scotland whether he was now in a position to announce the composition of the Board to be set up under the Act, and when it was proposed to set up the Amenities and Fishery Committees, authorised by the Act. Mr. Johnston said he hoped that it would be possible to announce the membership of the Board and of the two Committees within the next few weeks.

Electricity in the Home

During the debate in the House of Commons on August 3rd on the work of women in national service, Lady Apsley expressed the hope that our post-war planners would remember the importance of the housing question to both men and women in the Forces. Houses for them should be of simple design, based on the use of electricity and gas. They might have pre-fabricated standardised interior fittings, but the exteriors should be of pleasing local materials and they should be well sited—all essentials to a satisfactory home.

She would like to know whether the Ministry of Supply was designing, and would put on the market at reasonable prices after the war, all types of electrical labour-saving apparatus, such as refrigerators, electric irons, cookers and so forth.

Adjournment

The House of Commons adjourned for the summer recess on August 6th. The Leader of the House stated that members would reassemble on the first sitting day after September 19th unless it became necessary to call them together before that date.

Alternator Protection

Application of Circulating Current Systems

By A. Abbott

EXPERIENCE during the past thirty years has proved circulating-current protection to be the simplest and most reliable means of protecting the stator of an AC generator from damage due to faults in the phase windings. Opinions differ considerably as to the origin of such faults, since the design and construction of the machine, together with the conditions of operation at the instant of the fault, have a large bearing on the matter. In order to minimise damage to the stator stampings and prevent the spread of fire to healthy parts of the winding the circulating-current protection should function so as to reduce all available electrical energy to zero in the shortest possible time after the fault develops, first, by isolating the stator from the general network and, secondly, by suppressing the field voltage across the rotor winding.

Protection must be stable and show no tendency to function when the machine is supplying faults external to the protected zone. In other words, the protection must possess a high stability ratio, which was defined by Clothier as "the ratio of the setting of operation to the setting of encroachment"; this should never be less than 2 to 1 for any practical scheme.

Considerable increase in sensitivity and stability has been brought about by improved relay design and by a better understanding of current transformer performance, but even yet certain fundamental features seem to be insufficiently appreciated.

A circulating-current system is essentially the balancing, by means of current transformers, of the outgoing and incoming currents of the machine, one set of current transformers being situated in the main connections between the machine terminals and the busbars (invariably placed in the switchgear for convenience and main-cable protection) and the other set in the neutral or incoming connections. The two sets are connected in series by interconnecting pilots, so that their EMF's assist in the circulation of a current in the circuit, the value of which is governed by the nominal ratio of the current transformers. Fig. 1 (a) shows this condition, a single-phase circuit being shown for simplicity. Provided the pilot leads A, B, C and D, and also the current transformers themselves, possess uniform characteristics, thus producing equal volt drops, the PD between points X and Y will be zero, hence they can be joined and no current will flow in that branch. Should, for instance, the pilots be of unequal length, the difference in the volt drops would cause a PD to appear across the points X and Y, thus producing a resultant current in the branch. In order to reduce this current to zero, the electrical characteristics of the circuit must be equalled on either side of X and Y by means of a balancing resistance, so that the sum of the respective volt drops in each half of the circuit are equivalent. The branch XY is known as the "mid-point" connection of the circuit which, if replaced by the coil of a relay possessing a fixed number of ampere turns, will carry the required operating current when the PD attains a sufficient value. This value of PD will be a measure of the difference in terminal EMF's of the two current transformers by virtue of the primary currents passing under fault conditions (Fig. 1 (b)).

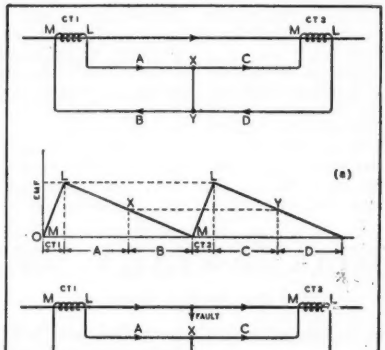


Fig. 1.—Protective scheme with interconnected current transformers

Three main features are to be noted. First, the PD across X and Y should always be zero (or as near zero as possible) when the current transformers are carrying identical primary currents; secondly, the relay coil carries only the out-of-balance current; thirdly, the circulating current flowing when the current transformers carry equal primary

currents does not energise the relay. With careful circuit design and layout, the first point can be achieved within practical limits, since the second point is the operative feature of the protection and is at all times directly proportional to the PD across the "mid-point." To maintain a high stability ratio this PD should be as small as possible under normal healthy conditions.

The lower the current required to operate the relay, the nearer does it approach the setting of encroachment, *i.e.*, that value of fortuitous differential current (" spill " current) which exists to a maximum degree under through-fault conditions. Referring again to fig. 1, if the relay connected across points

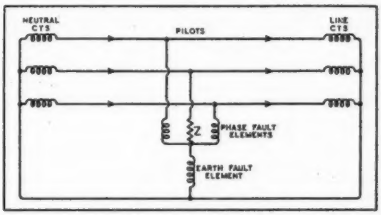


Fig. 2.—Merz-Price system, three-phase connection

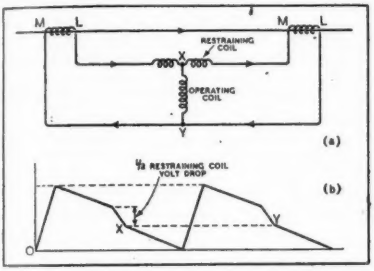


Fig. 3.—Biased differential protection, single-phase connection

X and Y is set to operate at 5 per cent. on the basis of 5-A secondary-current transformers (*i.e.*, 0·25 A) the maximum " spill " current permissible for a stability ratio of 2 to 1 would be 0·125 A, no matter how high the value of primary current, which in practice can exceed ten times the normal under through-fault conditions. This scheme of protection, the Merz-Price system, is shown in the modern three-phase form in fig. 2. The centre pole of the relay functions for earth faults only on the machine windings, and the two outer poles for phase-to-phase faults. Using modern induction-pattern inverse-time-limit relays, the earth-leakage setting can be as low as 5 per cent.; the phase-fault settings are usually somewhat higher, *e.g.*, 20 per cent. In order to keep the circuit symmetrical a balancing impedance, equivalent to the value of the phase-fault relay elements, should be added in the yellow-phase connection to the relay star point.

This type of protection functions quite well, but has the disadvantage of having no biasing or restraining feature against operation under both normal and through-fault conditions, such as is possessed by the differential scheme of protection shown in fig. 3. In this system bias is achieved by incorporating a second relay coil, known as a restraining coil, in series with the pilots, which exercises a reverse or restraining torque on the relay movement proportional to the circulating current between the current transformers. This restraining coil is centre-tapped, so that the relay-operating coil again forms the " mid-point " connection of the circuit. The voltage drops on either side of the connection XY summate to zero as in the Merz-Price scheme, assuming identical circuit characteristics. The stability ratio of this form of protection is infinity, because the tendency of the relay to operate under through-fault conditions, due to out-of-balance or " spill " current in the operating coil, is nullified by the restraint exercised on the relay movement by the restraining coil, this being proportional to the circulating current which in turn is a measure of the primary current flowing through the current transformers.

This biasing feature, usually based on a percentage of the normal rated current of the current transformers, affords the possibility

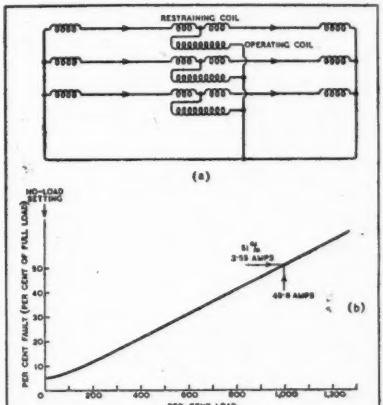


Fig. 4.—Percentage biased differential relay

of a high relay sensitivity. In practice relay settings as low as 2 per cent. can be obtained that are consistent with perfect stability, using modern induction relays and current transformers of standard design.

Fig. 4 (a) illustrates the biased differential protection in the three-phase form. The characteristic curve of the relays in fig. 4 (b) shows how the differential current required to flow through the relay operating coil before it functions. A similar test on the Merz-Price system shows how the "spill" current in the relay operating coil encroaches upon the setting of operation, which is fixed for all values of through current; hence the stability ratio is reduced.

TABLE I

Comparative test figures for the two circulating-current methods

Test Condition	Biased-Differential Protection, 5% bias, C.T.S. 1200·5									Merz-Price Protection*					
Stability Tests Assimilated through faults	Primary Amps.			Relay Restraining Coil Amps.			"Spill" Current in Relay Operating Coil			Pilot Current			Relay Coil Current		
	R	Y	B	R	Y	B	R	Y	B	R	Y	B	R	Y	B
1. Full-load, three-phase	1180	1193	1190	4·98	4·98	5·0	·017	·019	·014	5·0	4·99	5·01	·021	·012	·017
2. Ten times full-load	11800	11940	11900	49·8	49·8	50	·174	·188	·143	50·1	50	50·2	·148	·082	·145
3. Single phase, through-fault..	1200	—	—	5·0	·012	·010	·005	·007	·009	5·0	·017	·015	·011	·006	·013

* With 5 per cent. earth-fault and 10 per cent. phase-fault settings.

quired to operate the relay increases with the percentage load or through-fault current supplied by the machine, whereas with the plain Merz-Price system a fixed value of differential current is required to operate the relay at all values of primary current.

The importance of the biasing feature is indicated in the accompanying table. The three-phase short-circuit stability test (No. 2) up to ten times normal load gives 49·8 A in the restraining coil of the relay. At this value of through-current from the curve (fig. 4 (b)), approximately 51 per cent. of the normal full-load secondary current is

To sum up, the general tendency now is to provide a scheme of protection which is inherently restrained (not necessarily under normal healthy conditions) from functioning when faults occur externally to the protected apparatus and which is consistent with a high relay sensitivity. While an inherently biased form of protection is often demanded for inter-connectors and busbars and even for the less important feeders, similar attention is not paid to its application to generators.

NEW BOOKS

The Technique of Radio Design. By E. E. Zepler, Ph.D. Pp. 311; figs. 260. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 21s.

The problems in the design of radio receivers of good performance and reliability are many. It is a comparatively simple matter, granted a sound knowledge of the theory of circuits, to draw out on paper a design which will fulfil all the requirements, but the translation of this design into an actual prototype, ready for production, and free from the hundred and one faults which may creep in in practice is quite a different matter.

In this manual the author, a design engineer himself, has made an excellent attempt to set down his experiences for the benefit of others. As he says in his preface, intimate details of many aspects of receiver work are given, rather than a comprehensive treatment, general principles being adequately dealt with in the existing excellent textbooks. One of the main qualifications of a designer is to be able to foresee complications, and a study of this book will indicate how many of these can be overcome in practice.

The book opens with a "refresher" chapter on fundamental theoretical facts, and then goes on to practical considerations of aerial circuits, amplifier stages, detection and frequency changing, selectivity, receiver noise, gain control, the principles of screening (a particularly interesting chapter), undesired feedback, hum, distortion and power supply. There is a short chapter on routine measurements, and an even shorter final one on fault finding, both of which could well be expanded in future editions.

Throughout the book the author gives typical problems as examples, and shows how they can be worked out quantitatively, and what approximations may legitimately be made. In fact, the whole basis of the treatment is the translation of theory into practical design. The manual is one which designers and others will find of considerable interest and use, since it contains much information which it would be very difficult to discover elsewhere.—W.E.M.

Workshop Practice Simplified. By P. W. Blandford. Pp. 32; figs. 24. Sir Isaac Pitman & Sons, Ltd. Price 1s. 3d.

Providing concisely the basic information for the beginner, this little book will prove useful to apprentices and trainees, particularly A.T.C. members and R.A.F. recruits training to become flight mechanics, fitters, armourers, instrument repairers, etc.

Infra-red Drying

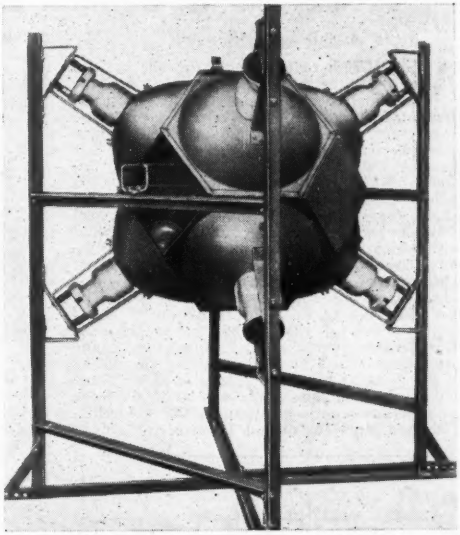
Results with Large "Oven"

PARTICULARS of results obtained in the drying of paints by means of infra-red rays have been sent to us by the Metropolitan-Vickers Electrical Co., Ltd. In one instance the problem was to provide a more serviceable finish to large metal assemblies, which involved several coats of paint and a considerable area of putty filling. The existing oven capacity was insufficient to deal with the increased requirements. One of these assemblies comprised a cylindrical body 17 ft. long with a diameter varying from 4 ft. 9 in. to 3 ft., the other was 17 ft. 6 in. long, 8 ft. high and tapered from 12 in. to nothing in thickness. The temperature was limited to 150 deg. F as a maximum on account of the nature of the materials.

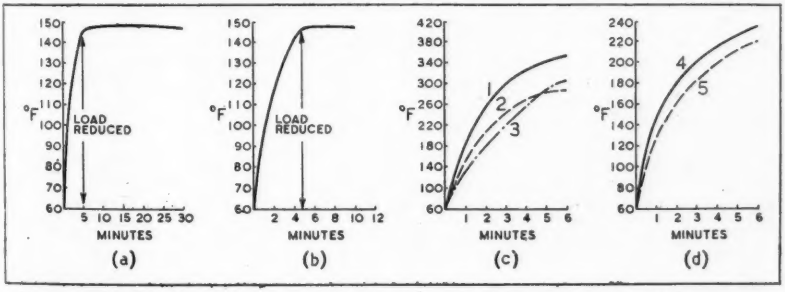
As production methods did not lend themselves to the adoption of a conveyor principle, an "oven," 18 ft. long by 10 ft. 6 in. high, was constructed of two banks of "Metrovick" infra-red industrial lamps, between which the assemblies mounted on bogies were wheeled. In order to save time in the process the banks were loaded up beforehand; thereafter the load was reduced to the minimum necessary to offset convection and radiation losses, so as to maintain a constant temperature. A number of permanent equipments embodying an automatic timing apparatus have been installed.

An example of an application of the treatment to small work is provided by a scheme for preheating to over 400 deg. F solid steel caps, each weighing 4½ oz., for tinning. These steel caps were fed at the rate of one every 90 seconds through a chute in the centre of a small assembly loaded at 2 kW.

Results indicate that the process often saves 90 per cent. of the time required by existing methods. The paints used consist chiefly of lacquers and synthetic enamels having an alkyd, glycerol, phthalate, urea and phenolic base. Unit construction of the assembly



Equipment (2 kW) for pre-heating small solid steel caps before tinning



Heating-curves for (a) putty drying: (b) finishing paint coat: (c) 1, sheet-steel cover band; 2, small and 3, large aluminium alloy castings: (d) 4, cast-steel cylinder (⅜ in. wall); 5, cast-iron bearing bracket

facilitates adaptation to modifications in the type of work. Uniformity of finish is secured by the close control of temperature possible and that without skilled labour or preliminary warming of the oven. Other advantages of infra-red heating include saving in floor-space (for some kinds of work the equipment can be suspended from the ceiling) and the absence of fans and high temperatures near the plant.

Applications of infra-red rays, apart from paint drying, include preheating of metal plates before processing, expansion for shrink-fitting, heating of thermo-plastic materials for bending or moulding and various dehydration processes.

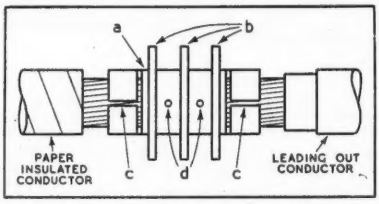
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Cable-seal Sleeves

A DEVICE that is intended to prevent the leakage of insulating oil and compound from the terminal ends of cables insulated with impregnated paper, particularly when their dividing boxes are mounted in an inverted vertical position, has been designed by JAMES HILL & SON, 22, Lytham Road, Manchester, 19.

According to British patent 10142/43, a tubular copper sleeve (a) is provided with external radial fins (b) which form a labyrinth seal between the cable joint and the compound with which the dividing box is filled; also they enlarge the surface area of the joint, as compared with that of a plain sleeve, so improving the adhesion of the compound to the joint. The fins also help to raise the temperature of the joint to that of the surrounding compound, thus retarding chilling and shrinkage of the compound round the joint during the filling of the dividing box. To ensure good electrical and mechanical jointing as well as to hold the sealing sleeve in position while soldering, T-shaped slots (c) extend inwards from each



Finned labyrinth cable sealing sleeve

end of the sleeve so that its ends can be closed tightly round the cable cores by means of pliers. Small holes (d) in the tubular portion facilitate filling the sleeve with solder; alternatively, this sleeve may be utilised as a sealing device only in dividing boxes, the ends of conductors being brought out without joints.

Oil-cooled Welding Set

The latest addition to the range of arc welding equipment made by PHILIPS LAMPS, LTD., Century House, Shaftesbury Avenue, London, W.C.2, is a three-operator set designed according to B.S.1071/42 which can also be supplied for six and twelve operators.

The transformer is of the indoor type, oil immersed, with natural cooling tubes fitted to two sides of the rectangular tank, which is provided with lifting lugs, a flush oil gauge and drain valve. The primary windings are delta connected for 380/400/420/440 V, three-phase, individual voltages being selected by means of tappings and links situated above the oil level

Oil-filled welding transformer and reactors

when cold. The secondary winding is inter-star connected for 100 V (open circuit) between each phase and neutral, capable of delivering 900 A intermittently, the continuous rating being 54 kVA.

An ironclad combined switch and fuse is bolted to the transformer tank, which is mounted on four rollers and provided with an earthing terminal; the secondary terminals are protected within a sheet metal box. The three associated reactors, one serving each operator, are of the drum type, oil filled and provided with four wheels. Their maximum intermittent rating is 40 to 300 A at 40 V, current variation being obtainable in 32 steps by means of a radial switch fitted with a graduated indication plate; the output terminals are hooded.

The equipment is delivered complete with a first filling of "Pool" oil and such accessories as a cable, electrode holder, hand shield, protective eye-glasses, a chipping hammer, wire brush and pair of gauntlets.

"Bicolon" Wire

In the *Electrical Review* of July 30th (p. 134) particulars were given of a new insulating substance, modified "Nylon," for covering winding wires and details of tests were set out. Wire insulated with this material, under the name of "Bicolon," is now available from BRITISH INSULATED CABLES, LTD., Prescot, Lancs. The principal advantages claimed for the wire are that the insulation does not interfere with flexibility and its "space factor" approaches that of standard enamelled wire.

Meter Testing in Argentina

New Buenos Aires Building

HANDSOME new premises have recently been established in Buenos Aires by the Compañia Argentina de Electricidad, principally for the maintenance and testing of its consumers' meters. Some idea of the elaborate nature of the building is conveyed by the photographs reproduced with these notes.

Above: View of the exterior. Left: One of the offices. Below: Meter testing laboratory

On the ground floor are a store-room, the office of the inspector in charge of the meters and spare material, winch and monorail installations, a recreation room for the workers, a porter's lodge and a central telephone exchange.

The administration offices are on the first floor. In these correspondence is dealt with, and the statistics and numerical card indexes for the meters and accessory apparatus are kept. There is also a laboratory for testing domestic electrical apparatus, for the checking and periodical comparison of the testing instruments and for the examination of new types of meter.

On the remaining floors, there are lodged the offices for the distribution and control of operations, shops for cleaning and repairing meters, for machine fitting and painting, for electrical inspection and adjustment, rooms for the reception and despatch of meters provided for the Muni-

cipality, and lockers and baths for the staff. On the flat roof are situated premises for the machinery and winches, supplementary stores, tanks for the supply of water and fire-fighting devices.

To supplement the natural light admitted through the spacious windows, an extensive system of fluorescent lighting has been installed.

In a mechanical equipment hall, situated in the basement of the building, are motor-generator and transformer groups for providing testing current, together with the necessary control panels.

News from India

Proposed Research Workshop

THE Court of the Indian Institute of Science has passed a resolution pointing out that since it is almost impossible to import industrial plants for the manufacturing processes which are now being developed in the country, it is desirable that a mechanical engineering research workshop shall be established at the Institute to design and construct the necessary plants.

Engineering Organisations Amalgamate

Indian Engineering reports that the Managing Committee of the Bombay Engineering Congress has been authorised to give effect to a scheme for the amalgamation of the Congress and the Bombay Centre of the Institution of Engineers (India).

The Bombay Engineering Congress was founded in 1914 to further professional intercourse and to promote the circulation of matters of interest to the engineering and allied professions, but since the objects of the Institution are wider and because a strong central all-India organisation is on the whole more beneficial than small provisional organisations it has been felt for a long time that the two should amalgamate.

Technical Training

It is reported that so far 30,000 technicians have been enrolled in the technical training scheme sponsored by the Labour Department of the Government of India at technical schools and colleges.

Labour Unions

An item in the above-mentioned journal records the progress of the labour union movement in India, which is apparently considered not very satisfactory: "Like many other movements in India, when recognition is granted to the desire of labour to initiate organisations similar to the Western pattern, such opportunity is carried to the border line of absurdity. There were 81 trade unions at the end of 1941 and the total membership had increased to 142,359, states the latest report on the working of the India Trade Unions Act in Bombay. This shows only an average of under 1,760 members per union."

Calcutta Trams

From time to time during the past twenty years the Corporation of Calcutta has considered exercising its option to purchase the undertaking of the Calcutta Tramways Co. It is now reported that the Public Utilities and Markets Committee of the Corporation has decided to take over the system on the expiry of the present agreement at the end of 1944. It is proposed to administer the undertaking through an Agent.

Production of Lac

A considerably reduced yield of lac for all India (excluding Assam) during 1942 is shown in the final crop report of the Indian Lac Cess Committee. The 1942 final estimate for Katni lac is only 131,250 maunds and Kusmi lac 81,750 maunds, as compared with 267,250 and 166,250 maunds, respectively, for the year 1941.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

"Undue Preference"

AS is well known, the Electric Lighting Act of 1882 provides that an undertaking must not show any "undue preference" to any consumer; thus, two consumers occupying identical properties equidistant from the mains with exactly similar installations and loadings, using the same apparatus at the same times and imposing equal demands, must be entitled to the same rates of charge.

It is contended, however, that were different rates applied, any variance of one or more of these factors would destroy any case of "undue preference." If the phrase "similar circumstances" used in the Act be interpreted to mean that all the factors mentioned above must be absolutely identical, then it follows it would be a very rare occurrence, and allegations of preferential treatment would be extremely difficult to sustain.

Have any decisions been recorded to throw light on the matter, and have readers any decided views please?

Minehead. W. D. BATES.

[We have reminded our correspondent of the Wimbledon case (1939) in which a consumer successfully challenged a decision that if he were to be supplied on the same basis as other two-part tariff consumers he must restrict his demand at times of peak load. Perhaps readers who have come up against problems of this sort will relate their experiences.—*Editors, Electrical Review.*]

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Director of the British Electrical and Allied Manufacturers' Association, Mr. V. Watlington, informs us that, with the consent and approval of the Maidstone Corporation, the B.E.A.M.A. is retaining the part-time services of **Mr. E. E. Hoadley,** Maidstone borough electrical engineer, to assist in its efforts to satisfy the public demand for electrical equipment in the post-war housing programme. As readers know, Mr. Hoadley is chairman of the Council of E.D.A., and hon. secretary of the I.M.E.A.

Mr. E. E. Hoadley

In announcing the forthcoming retirement of **Mr. P. J. Robinson** from the position of city electrical engineer and city lighting engineer of Liverpool in our issue of July 30th we referred to him as being an O.B.E. He is, of course a Commander of the Order (C.B.E.), this honour having been conferred upon him in January this year.

The following appointments have been made at the Witton works of the General Electric Co., Ltd.:—Assistant manager, Switch Department, **Mr. C. J. O. Garrard,** M.Sc., A.M.I.E.E. Chief consulting engineer, Switch Department, **Mr. W. R. Cox,** B.E., A.M.I.E.E.

Messrs. M. C. Jones, W. A. Jones and **J. C. Drewe** have been appointed directors of Peto Scott Electrical Instruments (Holdings), Ltd. **Mr. W. S. Worthington** and **Mrs. A. M. Worthington** have resigned from the board.

Mr. W. T. Dalton, M.I.E.E., chief engineer to the Newcastle-on-Tyne Corporation Transport and Electricity Department, is retiring after over 41 years' service and the Committee has decided to place on record its appreciation of his services. Mr. Dalton was born at Lewisham, Kent, and received his technical education at Finsbury College and privately with a tutor, serving an apprenticeship with Siemens Bros. & Co., Ltd. He was appointed assistant electrical engineer with the Newcastle undertaking in December, 1901, and that month attended the opening of the first electric tramway in the city. Later he assisted in the construction and starting up of the Manors power station. He became chief engineer in 1926.

Mr. W. T. Dalton

The L.N.E.R. announce that the following appointments have been made: **Mr. J. Blair,** assistant to chief mechanical engineer, Doncaster, to be mechanical engineer (outdoor), Doncaster, in succession to the late Mr. C. H. M. Elwell. **Mr. S. King,** district docks machinery engineer, Hull, will succeed Mr. Blair. **Mr. A. Moss,** signal and telegraph engineer, Edinburgh, to be assistant to engineer (signals), London. **Mr. L. Preston,** assistant signal and telegraph engineer, London, to be acting assistant to engineer (signals), Edinburgh.

Following the death of Wing Commander R. F. S. Leslie, reported in our Obituary Section, **Lt.-Col. the Hon. M. T. Henderson** is now acting as chairman of the Union Lamp & Lighting Co., Ltd., for the duration of the war.

Sir Walter St. D. Jenkins and **Mr. G. R. Thursfield** have been appointed directors of Electrical Switchgear and Associated Manufacturers, Ltd.

Many of our readers will wish to join us in congratulating **Mr. & Mrs. Henry M. Sayers,** who will be celebrating their diamond wedding on August 17th. They were married at St. Mary's Church, Upper Street, Islington, on August 17th, 1883.

Mr. H. M. Sayers

David Brown & Sons (Huddersfield), Ltd., announce that Lord Brabazon, Sir Arthur Matthews, Sir Alexander Dunbar and Mr. W. H. Child have been elected directors in addition to Mr. David Brown, Sir Ernest Roney and Mr. W. Killingbeck. Lord Brabazon has been elected chairman and Mr. David Brown continues as managing director. These appointments have the approval of the Ministry of Production. Lord Brabazon is president of the British Electrical Development Association.

Three new directors have been appointed to the board of Ferranti, Ltd. They are, **Mr. W. G. Bass,** B.Sc., A.K.C., A.M.I.E.E., London manager of the company, **Mr. C. W. Bridgen,** A.M.I.E.E., general sales manager, and **Mr. W. C. Pycroft,** C.A., financial director of Nestlé's Milk Products, Ltd.

Mr. Bass, a graduate of King's College, London, served with the Royal Artillery throughout the last war. In 1918 he was engaged by Cleveland and Durham Power Co., leaving that company in 1921 to join the staff of Merz & McLellan as assistant engineer in the Electrical Department at Newcastle. He became a member of the Ferranti staff in 1927, and went to Poland as B.E.A.M.A. representative member of H.M. Government Trade Mission in 1934.

Mr. Bridgen joined the Ferranti staff in 1913. He was with the London Regiment in France from 1915 to 1919.. Returning to Hollinwood, he was engaged for a time on experimental work before being transferred to the commercial side of the company's activities. He became

district manager of the Midlands and South Western Areas in 1930, and was promoted to the position of general sales manager in 1934. He is a member of the Council of the I.E.E., member of the I.M.E.A.-B.E.A.M.A. Joint

Mr. C. W. Bridgen

Mr. W. C. Pycroft

Committee, and vice-chairman of the Meter Manufacturers' Association.

Mr. Pycroft is a director of several companies and a liveryman of the Worshipful Company of Wheelwrights. During the last war he served with the Royal Artillery in Salonika. As a chartered accountant he was associated for ten years with the late Mr. A. W. Tait, at one time chairman of Ferranti, Ltd. He has also had experience in banking.

Mr. Alan Brown, of the Gatineau Power Co., Ottawa, has been elected president of the Canadian Electrical Association for 1943-44.

Obituary

Wing Commander R. F. S. Leslie.—We regret to learn that Wing Commander R. F. S. Leslie, D.S.C., D.F.C., A.F.C., chairman of the United Lamp & Lighting Co., Ltd., has been killed on active service in North Africa at the age of fifty-three. Wing Commander Leslie had been chairman of the company since 1937. During his service career he was A.D.C. to Lord Reading when Viceroy of India, and during the last war he was awarded the Italian Gold Medal.

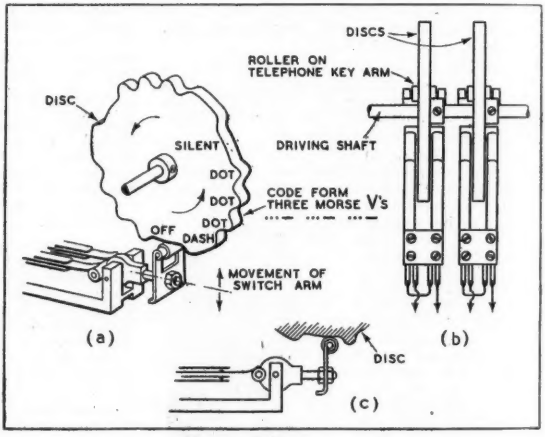
Will.—Mr. E. Charrington, formerly a director of the Urban Electric Supply Co., Ltd., the Cornwall Power Co., the Truro Electric Supply Co., the Woodbridge and District Electric Light Co., and the Twickenham and Teddington Electric Supply Co., left £40,694 with net personalty £35,722.

Impulse Transmission

FOR the purpose of sending up to six code signals over telephone lines to reception points, an automatic impulse system embodying standard components has been designed by Mr. F. C. Orchard, borough electrical engineer, Hornsey. The requisite signal is selected by closing a small key switch and by depressing a self-resetting operating key for about two seconds. The transmitter sends out the appropriate signal automatically and on completion the unit shuts down and resets itself. Coloured lamps indicate the correctness of the signal. A new signal can be substituted on the spot. At the receiving end a P.O. low-frequency buzzer is used to give audible signals.

The driving mechanism of the impulse generator is a fractional-HP motor with combined reduction gear to give ½ RPM at the output shaft. A ¼-in. diameter steel shaft between two bearing supports is lined up with the gear box and driven through an insulated coupling. Discs of insulating material, with peripheries cut to suit the code signals, are fixed to the shaft. One disc controls the supply to the motor maintaining circuit. On the base is a row of telephone switches, the insulated handle keys of which are replaced by knurled rollers. As the disc rotates the roller rides against the chased periphery and the switch opens or closes to complete or open the signal circuit.

The instrument is mounted on a base board 15 in. by 6 in. It was originally developed in connection with an air-raid warning system, but other applications are proposed, such as for inter-signal-box communication, a possible use which is being considered by a railway company.



Automatic impulse generator
(a) Three-quarter view of disc and switch. (b) Plan showing relative positions of switches and discs. (c) Detail of roller attachment to key arm following serrations on periphery of disc

COMMERCE and INDUSTRY

Local Authority Contracts. Passenger Vehicle Dimensions.

Invitations to Tender

UNDER Section 266 of the Local Government Act, 1933, it was clearly intended that local authorities should give public notice of their intention to enter into contracts for the supply of goods and make public invitations to tender. The model standing orders issued for the purposes of the Section in 1934 are so framed that any departure from this rule must be exceptional and it is believed that the standing orders of most local authorities are substantially similar.

In referring to this matter in a circular sent to public authorities, the Ministry of Health says that it has received representations that in present conditions, with so many goods and materials subject to control, it is wasteful to invite competitive tenders. The various controls which have been established are not uniform, but in many cases there is such complete control of price, quality and time and place of delivery, as to exclude effective competition.

The Minister therefore considers that some extension of the exceptions made from the general principle can be justified where there cannot be effective competition or where competition might lead to an unnecessary use of road or rail transport. An addendum to existing standing orders to give effect to this is suggested but it is emphasised that each case must be determined upon the facts. It is considered to be not in the public interest that by any amendment of standing orders a wider breach should be made in the application of the principle than is reasonably justified by considerations of control and transport.

Machine Shop Yearbook

The second edition of "The Machine Shop Yearbook and Production Engineers' Manual," edited by H. C. Town, M.I.Mech.E. and published by Paul Elek (Publishers), Ltd., Africa House, Kingsway, W.C.2, at 30s. 10d. post free (31s. 6d. abroad), is claimed to be virtually a new book.

In Part I there are special articles on electrical control gear for machine tools, optical instruments in engineering, centreless grinding and the direct-hydraulic system. It may be thought that the first article deals too exclusively with the products of one manufacturer, albeit a leader in this field.

Part II contains a good deal of new material including the addition of notes on electric furnaces and salt baths in the section on steel heat treatment.

Part III is a new section containing abstracts of a variety of articles from many sources; there are 47 of them in seven groups.

Post-War Kitchen

An experimental kitchen, incorporating practical labour-saving suggestions from readers of the *Sunday Chronicle* and erected by Easiwork, Ltd., to the design of Mr. H. F. Hoar, F.R.I.B.A., is now being tested at the Good Housekeeping Institute, 30, Grosvenor Gardens, London, S.W.1. Easy to keep clean and tidy and pleasant to work in, the kitchen has plenty of cupboards and working space, the latter all on the same level. The electrical equipment, for which the British Electrical Development Association was responsible, is very comprehensive, the main appliances consisting of a cooker, refrigerator, sink refuse disposal unit and dish-washer; the dish-washer is not considered a practical proposition for a small household, but has been included because of the great demand. Three 15-A plug points have been provided for small appliances such as kettles, food mixer, etc. Inspection and criticism of the kitchen are invited by the Institute.

A general view of the experimental kitchen showing electric cooker, kettle, dish-washer and food mixer

Flash Lamp Bulbs

The Board of Trade, in consultation with the Central Price Regulation Committee, has made an Order amending the Flash Lamp Bulbs (Maximum Prices) Order (S.R. & O. 1943 No. 247) in the following ways:—As the period in which wholesalers and retailers were allowed to clear any stocks of Far Eastern bulbs bought at a higher price has now elapsed, the provisions and schedule in the original Order which fixed

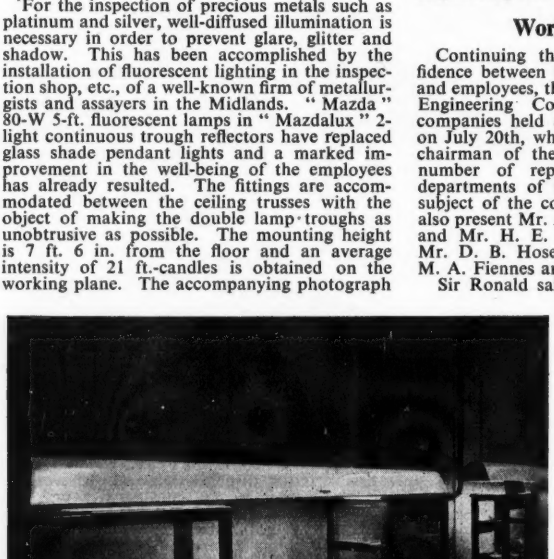
these prices are now deleted. The definition of flash lamp bulbs has been altered (*a*) to exclude bulbs used in miners' safety lamps and (*b*) to include only bulbs designed and manufactured for intermittent use.

The maximum prices for tested bulbs have not been altered, but when untested bulbs are sold by one trader to another and any defective bulbs are returned within 28 days from the date of consignment, the maximum price is to be reduced by an amount in proportion to the number of defective bulbs. When a retailer sells untested bulbs to the public, the same provision applies if any defective bulbs are returned the day after the sale. A defective bulb is defined as one which contains defects which can be discovered by any of the tests normally used in businesses handling bulbs.

This Order, the Flash Lamp Bulbs (Maximum Prices) (No. 2) Order, 1943 (S.R. & O. 1943 No. 1084) will come into force on August 16th. Copies are available, price 1d., through any newsagent or bookseller or direct from H.M. Stationery Office.

Fluorescent Lighting for Inspection

For the inspection of precious metals such as platinum and silver, well-diffused illumination is necessary in order to prevent glare, glitter and shadow. This has been accomplished by the installation of fluorescent lighting in the inspection shop, etc., of a well-known firm of metallurgists and assayers in the Midlands. "Mazda" 80-W 5-ft. fluorescent lamps in "Mazdalux" 2-light continuous trough reflectors have replaced glass shade pendant lights and a marked improvement in the well-being of the employees has already resulted. The fittings are accommodated between the ceiling trusses with the object of making the double lamp troughs as unobtrusive as possible. The mounting height is 7 ft. 6 in. from the floor and an average intensity of 21 ft.-candles is obtained on the working plane. The accompanying photograph shows the solution of what has been a particularly difficult problem of lighting. The balances have an extra "beam" fitted and are marked in vertical gradations. By the addition of small counterweights very fine differences in weighing are achieved—thus the beam is a vernier type of measuring scale. One 5 ft. fluorescent lamp in this case serves for two balances where hitherto one 100-W concentrating fitting had been used on each. A small white matt reflecting surface is placed inside the front and at the floor of the balance proper and reflects light on to the vertical beam. The contractors for the installation were the Stuart Electrical Co., Ltd., of Birmingham.



Precision balances lighted by "Mazda" 80-W fluorescent lamps in "Mazdalux" fittings

Women's Engineering Society

A meeting is to be held on Friday, August 27th, at 6.45 p.m., in the English Theatre, The University, Edmund Street, Birmingham, when Miss Caroline Haslett, C.B.E., will speak on "Women in Engineering—To-day and To-morrow," Dr. Winifred Hackett, B.Sc., presiding. Miss Haslett's talk will be followed by a discussion, after which the meeting will consider the inauguration of a branch of the Women's Engineering Society in Birmingham.

Works Co-operation

Continuing the policy of establishing confidence between the directors and management and employees, the board of the Brush Electrical Engineering Co., Ltd., and its associated companies held a meeting in the staff canteen on July 20th, when Sir Ronald Matthews, J.P., chairman of the company, addressed a large number of representatives from the many departments of the offices and works on the subject of the company's finance. There were also present Mr. A. P. Good, managing director, and Mr. H. E. Midgley, Capt. R. C. Petter, Mr. D. B. Hoseason, Sir Richard Pease, Mr. M. A. Fiennes and Mr. W. M. Good, directors.

Sir Ronald said that he had been impressed by the improvements seen in every department of the works, and also by the spirit of co-operation and understanding which existed. For the creation of that support, and for the general improvement in the results, the greatest possible credit must be given to the Works Production Committee and Sub-Committees. A lot was heard in these days of what was called "the profit motive." Out of the net profit earned by the company, which represented 3·86 per cent. of the total income, no less than 2·5 per cent. had been "ploughed back" into the business, and only 1·36 per cent. had actually left the coffers of the company as a reward to those people who had lent the use of their money. In other words, the measure of efficiency of an enterprise, whether it be publicly or privately owned, was its ability to pay good

wages to its employees for good work, to be able to renew its plant and machinery and generally keep up-to-date.

Brush Scholarships

The Brush Electrical Engineering Co., Ltd., has awarded scholarships to Messrs. William C. Allen (18), and David J. Cockrell (17); the former is at present serving an apprenticeship with the company and both are members of the Air Training Corps, with proficiency certificates. The scholarships are each of the value of £75 per annum, tenable for four years, the first year to be spent at the company's Loughborough works and the remaining three years at a British university. They are intended to enable students of limited means to take advantage of the excellent training afforded by the Brush college apprentice sandwich course. After taking their degree, scholarship holders return to Loughborough for a final year of apprenticeship, during which they rank as second-year college apprentices.

Elexcel Dramatics

The Xcel Players, comprising employees from Elexcel, Ltd., recently gave a performance of the popular play "Lover's Leap" at the Concert Hall, Broadgreen Hospital, Liverpool, the proceeds being given to the Sunshine Home for Blind Babies. There was a large audience and the Xcel Players were in consequence able to send a substantial cheque to aid this very deserving cause. It must be mentioned also that a very good performance of the sparkling comedy was given by the actors and actresses concerned who greatly pleased the audience with the high standard of their acting.

A scene from "Lover's Leap" performed by the Xcel Players

Dimensions of Passenger Vehicles

For many years operators of public service vehicles have considered that there was need for less restrictive regulations governing vehicle dimensions, but pre-war approaches failed to secure the approval of the Ministry of War Transport. More recently the Associated Road Operators, Ltd., the Commercial Motor Users' Association, the Municipal Passenger Transport Association, and the Public Transport Association reopened the matter and prepared a memorandum setting out those revisions which they considered were desirable. The memorandum was submitted to the Society of Motor Manufacturers & Traders in order that a joint approach, representative of operators and manufacturers, might be made to the Minister of War Transport.

Recently a meeting was held between representatives of the operators' organisations and of the Commercial Vehicle Committee and Body Builders' Section of the Society of Motor Manufacturers & Traders at which agreed proposals were formulated. At this stage the proposed revisions of the regulations concern overall length, overall width, overall height, and weight, but it is recognised that if the approval of the Ministry is obtained for the proposed revision of these regulations then consequential amendments of other regulations will be necessary.

A Technical Sub-Committee has been set up to determine the representations which are to be made to the Ministry. The operators' representatives appointed to serve on this Sub-Committee are Mr. A. F. Bentall (London Passenger Transport Board), Major F. J. Chapple (Bristol Tramways & Carriage Co., Ltd.), Mr. A. Twidle (B.E.T. Federation, Ltd.), and Mr. W. C. Whalley (Manchester Corporation Transport Department). Representing manufacturers there are Mr. J. A. Dorr (Dunlop Rubber Co., Ltd.), Mr. A. T. Froggatt (Metropolitan-Cammell-Weymann Motor Bodies, Ltd.), Mr. V. W. Pilkington (Leyland Motors, Ltd.) and Mr. C. M. Simpson (Daimler, Ltd.).

Overcoming Labour and Material Shortages

An impressive exhibition entitled, "A Great Achievement," on view at the Old Hall of the Royal Horticultural Society, Vincent Square, London, S.W.1, this week demonstrates how by ingenuity and economy in use, shortages of materials have been overcome so that the flow of materials has not only been maintained but multiplied. Substitution, alteration of specifications, redesigning of components, remaking and reclaiming of unserviceable equipment all go to save raw materials and, perhaps most important of all, labour.

Separate sections of the exhibition cover raw materials (e.g. timber, iron and steel, non-ferrous metals, paper, etc.), reductions in man-hours, reclamation, utilisation of materials previously wasted and savings in materials in short supply due to loss of territory. An example of an important contribution by the electricity supply industry is given pictorially by a comparison of large concrete and wooden cooling towers,

the former saving nearly 7,000 tons of wood. The economies in materials and time accruing from the use of electric forging and welding are also pointed out.

New Fire Guard Orders

The Ministry of Home Security has made three new Orders governing fire-watching duties. The age for compulsory service for men is raised from 60 to 63 ; women become exempt at the age of 45. Women who have domestic responsibilities are relieved of duties at the premises in which they work and the rules are relaxed for women in other directions. Steps are being taken to ensure that men working at places covered by the Business Premises Order shall not escape their responsibilities.

The new Orders are the Fire Guard (Business and Government Premises) Order, 1943; the Fire Guard (Local Authority Services) Order, 1943; and the Fire Guard (Medical and Hardships Exemption) Order, 1943. Existing Orders and regulations are revoked by these new Orders.

Fatality

A small defect in a permanent waving machine flex was stated to have caused the death of Mrs. Sadie Wheeler (35), a hairdresser's assistant, on whom an inquest was held at Bournemouth recently. Evidence was given by a customer that as Mrs. Wheeler reached up to one of the heaters she cried out and fell, dragging the machine on top of her. Mr. McGuire, of the Bournemouth & Poole Electricity Supply Co., Ltd., said that the flexible cord on one of the heaters was broken without apparent damage to the protective covering, and the wire might have pierced the covering. At the connection to one of the heaters the strand of the flexible conductor protruded slightly from the insulating material. The machine was otherwise in order.

"Normandie" being Refloated

Good progress has been made with the work of refloating the former French liner *Normandie* (since renamed the U.S.S. *Lafayette*) which capsized and sank in New York Harbour on February 9th, 1942, after catching fire. Early this week it was reported that the liner was afloat with a list of 48 deg. and that there was no further danger of the ship's breaking her back or smashing into the pier.

Watertight Switch Box

We regret that in the notes on this subject in our last issue an error occurred in the address of the makers, Callender's Cable & Construction Co., Ltd. The correct address is Hamilton House, Victoria Embankment, London, E.C.4.

Trade Announcement

Following the recent announcement that Mr. W. E. Pott had disposed of his interest in E. Dawson (Lamp Factors), Ltd., we are informed that this has been acquired by Lieut.-Col. C. H. Blackburn and Mr. A. H. Body, directors of C. H. Blackburn & Co., Ltd. The policy of the company, which took over the business founded in 1914 by Mr. Pott, will remain the same under the management of Mr. Body, the other directors, Lieut.-Col. Blackburn and Lieut. Taylor, being on active service.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of August 4th:—

CADMAS. No. 623,439, Class 1. Electroplating salts.—R. Cruickshank, Ltd., 121-135, Camden Street, Birmingham, 1.

No. 623,090 (Design). All goods included in Class 8. To be associated with No. 623,044. (Same design), Class 9. Scientific, nautical and surveying instruments and apparatus; electrical instruments and apparatus not included in other classes; photographic, optical, weighing, measuring, signalling, checking (supervision), life-saving and teaching apparatus and instruments; coin or counter-freed apparatus; talking machines; cash registers; calculating machines; fire extinguishing apparatus; parts (not included in other classes) of all the said goods, all being goods made wholly or partly of thermo-setting or thermo-plastic mouldable material.—E. K. Cole, Ltd., Ekco Works, Priory Crescent, Southend-on-Sea.

PORTAWAY. No. 623,265, Class 9. Electrical conductors.—Frank Porter, 8, Portsdown Road, Stoneygate, Leicester.

CYMATRON. No. 623,438, Class 9. Electronic and thermionic discharge devices or tubes.—Rogers Radio Tubes, Ltd., 100, Sterling Road, Toronto, Ontario, Canada. Address for service is, c/o Marks & Clerk, 57-58, Lincoln's Inn Fields, London, W.C.2.

No. 623,552 (Pictorial design with word "Bestobell"), Class 17. Gutta percha, india-rubber, balata, artificial and synthetic rubber, asbestos, mica and products thereof not included in other classes, etc.—Bell's Asbestos & Engineering Co., Ltd., Bestobell Works, Slough, Bucks. To be associated with No. 440,911 (2382) 1 and others.

TEXYLON. No. 623,107, Class 17. Synthetic-resin plastics for use as rubber substitutes; substances in the nature of rubber manufactured from sulphuretted fats or from sulphuretted fatty oil compositions.—Scott Bader & Co., Ltd., Wollaston Hall, Wollaston, Northants.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Makers of BALKITE glass jars for rectifiers of that name. Refrigeration & Allied Products, Ltd. (late of Buckingham Palace Road, S.W.1).

Univolt Electric, Ltd.

ELECTRICITY SUPPLY

Proposed Eastbourne Increases. Electrode Boilers at Glasgow.

Ardrossan.—CHOICE BETWEEN ELECTRICITY AND GAS.—At their next meeting members of Ardrossan (Ayrshire) Town Council are to decide whether gas or electricity shall be used for street lighting under post-war town planning schemes.

Berwick.—ELECTRICITY CHARGES.—On the recommendation of the Lighting Committee the Town Council has approved electricity charges drawn up by the Scottish Southern Electricity Supply Co., Ltd.

OVERHEAD LINE.—Plans have been approved by the Corporation for the erection of an overhead electric line from Castle Terrace to Castle Hills Hospital for the Scottish Southern Electric Supply Co., Ltd.

Blackburn.—EXPERIMENTAL STREET LIGHTING.—The Emergency Committee has instructed the borough electrical engineer (Mr. R. H. Harral) to put into commission for a suitable experimental period of one month, a modified street lighting installation of 141 A.R.P. lighting points, at an additional capital cost of £180, plus the cost of electricity consumed.

Cheltenham. — SUPPLY TO FACTORY. — The Electricity Committee is to provide supply to factory premises at a cost of £1,416.

Eastbourne.—HIGHER CHARGES.—Increases in charges as from the meter readings nearest October 1st are recommended by the Electricity Committee. The proposed new charges for the town area are as follows, with existing rates in parentheses:—Lighting flat rate, 5d. (4¼d.) per kWh; domestic all-in tariff "unit" charge, ½d. (¾d.); heating and cooking flat rate, 1½d. (1¼d.) per kWh in winter and 1d. (¾d.) in summer; industrial power rate, 2d./1¼d. (1¼d./1d.) per kWh in winter and 1¾d./1¼d. (1¼d./1d.) in summer. In the rural area corresponding increases are recommended.

Glasgow.—HOSPITAL HOT WATER SUPPLY.—The Sub-Committee on Mental Services has agreed to the installation of three 350-kW electrode steam boilers in the laundry at an estimated cost of £6,300. It has also been decided that the following extra works shall be proceeded with as soon as possible: heating and domestic hot water supply for the solarium, involving new electrode heating boiler, etc., at an estimated cost of £3,900, and domestic hot water supply for a hospital block at an estimated cost of £6,300 plus £850, representing the proportion to be borne by the Corporation of the cost of a switchboard to meet the additional load.

Hull.—LOANS.—Application is being made by the Electricity Committee for permission to borrow £4,162 for mains and £7,528 for substation equipment for the provision of a bulk supply. Sanction has been obtained to borrow £1,186 for distribution extensions.

Kingston-on-Thames.—SATISFACTORY YEAR BUT NO PROFIT.—Reporting to the Town Council on the forty-ninth year's working of the Electricity Department, Alderman W. G. Eggleton, chairman of the Electricity Committee, described the period as a very satisfactory one. He went on to say, however, that there was no profit and there was no prospect of profit next year. Judged from that standpoint, the report would not be attractive, and, "looked at in the light of a profit making investment, it might be considered rotten," but from the public service point of view the undertaking was gilt edged. Points had to be watched very carefully, and diligent, careful foresight exercised in running the concern. Painstaking work had been put in by every member of the staff.

Alderman A. A. Gregory said the undertaking had been through a very difficult time. He referred to the valuable service given to the Electricity Committee by Alderman Eggleton.

Lichfield.—SUPPLY TO FARM.—The Electricity Committee has agreed to provide electricity supply to Gainsborough Hill Farm, Stonnall.

Macclesfield.—POST-WAR RECONSTRUCTION.—The Electricity Committee has decided to support the resolution of the Newcastle-under-Lyme Council dealing with post-war reconstruction (*Electrical Review*, July 16th, page 88). Nelson Town Council has also given its support to the policy outlined in the resolution.

Penrith. — OVERHEAD LINES. —The U.D.C. General Purposes Committee has approved an amended route of overhead wires to be erected by the Penrith Electricity Supply Co., Ltd.

Southport.—ELECTRICAL ECONOMY.—Councillor J. J. Irven, chairman of Southport Electricity Committee, has reported that electricity sales during the year ended March 31st were reduced by 13 per cent.

Wallsend.—NEW CABLE.—Plans have been approved by the Corporation for the laying of a 6,000-V cable.

TRANSPORT

Switzerland.—STEAM - ELECTRIC LOCOMOTIVES.—The shortage of coal in Switzerland has led the railway companies to electrify still more of their lines, to construct electrically driven shunt trucks, and to adopt many other methods of saving coal. Besides this, two steam locomotives have been equipped with electric steam generators, the electricity being supplied by an ordinary collecting trolley. This type of locomotive is extremely useful at medium-sized stations, where not all the lines have yet been electrified. Moreover, steam engines can thus be employed instead of electric locomotives, which are difficult to construct at present owing to the shortage of raw materials.—*Reuter's Trade Service.*

Coal Clauses

By a misplaced decimal point the coal clause figure in the Salford note in our July 30th issue (page 152) was given as ·0001d. instead of 0·001d. An error also occurred in the report of the Cardiff coal clause concessions, the correct figure being 0·0008d.

South Shields Judgment

Taxation of Trading Profits

THE House of Lords last week dismissed the appeal of the Crown against a decision of the Court of Appeal in a matter arising from an assessment to income tax made upon the borough treasurer of South Shields. In substance the question at issue was whether, as contended by the Crown, the trading undertakings of South Shields Corporation should each be separately assessed to tax or whether the Corporation was right in claiming collective assessment.

The Lord Chancellor said the case might be thus propounded:—In the year 1935-6 the Corporation paid interest amounting to £132,396 on borrowed money and on making such payment deducted income tax at the standard rate. For the same year the profits or gains of the Corporation were assessed to tax at £91,504. The Corporation agreed that it was liable to account to the Crown for tax on the difference between those two sums, but claimed to retain the rest. The Crown, however, contended that there was a further sum of tax deducted from interest which must be handed over, *viz.*, tax on £15,217, arrived at as follows: The profits of the Corporation on their electricity undertaking as assessed for 1935-6 amounted to £31,859 while the interest paid in that year on monies borrowed for the purposes of that undertaking amounted to £19,231, there being a difference between these two figures of £12,628. Similarly, the profits of the Corporation's transport undertaking amounted to £7,778 and interest on monies borrowed for the undertaking to £5,189. The difference of £2,589 together with the £12,628 mentioned above made up the £15,217, the handing over of tax on which was in dispute.

The Crown contended that the balance of profit of each of the undertakings thus arrived at was not to be treated as a contribution to meet the interest on loans not raised for the particular undertaking, or as being available for such a purpose. The Corporation, on the other hand, relying on the South Shields Corporation Act, 1935 (which authorised the establishment of a general fund into which all the revenues of the Corporation should be paid and out of which all expenditure should be met), made it lawful to use any part of the profits of the electricity and transport undertakings for the purpose of paying interest on monies borrowed for general purposes.

The Lord Chancellor said he entirely agreed with the judgment of the Master of the Rolls in the Appeal Court that the effect of the South Shields Act was to make it legitimate for the Corporation to do what it claimed to have done. The Act abolished all the existing statutory regulations and restrictions as to the application of the surplus revenues of the undertakings. The result was that there would be nothing illegal in the Corporation paying interest out of the mixed fund which contained its profits or gains. In his opinion the appeal failed.

Lord Russell of Killowen, Lord Macmillan, Lord Wright and Lord Romer expressed concurrence and the appeal was dismissed with costs.

Users and Makers

American View on Post-War Co-operation

MEANS of ensuring a continuance of electrical development after the war, a subject referred to in this week's leading article, were dealt with by Mr. H. V. Erben (American General Electric Co.) at the recent annual meeting of the Edison Electric Institute.

As reported by the *Electrical World*, Mr. Erben said that after the war a dilemma might face the electrical industry—on one side the power companies needing lower cost equipment to cope with the conditions in which they must operate and on the other side the manufacturers requiring higher prices for their goods because of greater costs of production. "There will be only one way out of this fix, the economies of repetitive manufacture resulting from agreement on an effectual degree of standardisation."

Mr. Erben considered that reactions to this idea among power company executives were generally sympathetic and co-operative but that "the impression seems to have been in a number of instances that an effective programme could be initiated and carried out by the manufacturers alone. Obviously this is impossible. The idea can be made a reality only through the joint efforts of both manufacturers and users. It must be supported by a definite desire to see something worked out along these lines within the over-all industry. It must be confirmed by a willingness on the parts of the manufacturers and of the power companies to accept compromises. It must grow into a programme in which the leaders of both branches of the industry believe and to which they will adhere. We should begin now to take steps towards putting this idea into practice, so that the difficulties will have been overcome when the power companies once again require heavy apparatus in volume."

Huddersfield Retrospect

Fifty Years of Electricity Supply

RECENTLY we reported the jubilee of electricity supply in Manchester, where the system was inaugurated on July 31st, 1893. Two days earlier, on Saturday, July 29th, 1893, Huddersfield had received its first public supply when, to quote the *Huddersfield Examiner* of that time, " at about six o'clock, after an inspection, the engines responsible for the generation of the electric fluid were started." Subsequently an inaugural tea was held, and fifty years afterwards the anniversary of the now greatly expanded undertaking has been marked in a similar way by a birthday tea and an informal meeting, the war preventing a celebration more worthy of the occasion.

The general impression gained by the opening of the electrical era at Huddersfield can be gleaned from the report of the inauguration ceremony, which has been reprinted from the local paper in the form of a souvenir booklet. One alderman, who said he had been taking a walk round, gave his impressions of premises lighted by the new medium. He observed that " the window of Mr. Thomas Walker's shop in King Street was really splendid; the back room was a bit dark, it would have to have a bit more candle power there." After remarking that the tea dealer's at the corner of John William Street " was splendidly lit up," he added that " the next place was gas and looked very gloomy."

Surprise in Store

Other evidence of rivalry with gas is recorded. Alderman Stocks, having stated that he objected to the severance of the Gas Committee and the Electric Lighting Committee, said he supposed that now gas and electric light must enter into a spirit of rivalry, which he hoped would be friendly but keen. As a sort of warning of the competitive potentialities of gas he mentioned improvements under way and said that if all went well " the town would be taken by surprise with the steadiness and uniformity of the gas light."

The ceremony concluded on a cordial note with a toast to the gas manager and it is recorded that " Mr. Herring, who had previously contributed a capital sea song, made a suitable and appropriate response."

A brief history of the work leading up to the commencement of supply was given by the borough electrical engineer (the late Mr. A. B. Mountain). In August, 1890, a Provisional Order was granted but it was not until May, 1892, that sanction to borrow the necessary money was obtained. Contracts were then entered into amounting to £29,693, including £20,640 to the Brush Electrical Engineering Co., Ltd., for plant and underground mains. Owing to a masons' strike the starting of the supply had to be abandoned until the following year.

The first three sets installed at the St. Andrew's Road station were steam-engine driven 250-kW alternators. The steam and feed pipes were arranged upon a ring system, all the valves being of Hopkinsons' make. Exhaust pipes were arranged so that the condensing plant could be used or the engines exhaust direct to the atmosphere. Switches and apparatus for regulating the supply of electrical energy were fixed upon a balcony, connection being arranged so that the alternators supplied energy at 2,000 V in parallel. The power was fed to four transformers through primary concentric mains manufactured by Siemens Bros. & Co., and the supply was distributed at 100 V through mains manufactured and laid by Callender & Co. Originally there were 83 consumers (compared with over 45,000 now).

The Third " Chief "

The present borough electrical engineer, Mr. Edgar Lunn, who is retiring at the end of the year, is the third " chief " of the undertaking, having in 1938 succeeded Mr. J. W. Turner, who was appointed in 1917. Mr. Lunn has served with the undertaking for 43 years.

At the birthday tea Alderman J. L. Dawson, chairman of the Electricity Committee, referred to Mr. Lunn's long service and also mentioned that Mr. Anderson, the power station engineer, had served for 42 years and Mr. Wright, the commercial assistant, for 41 years. One of the guests at the tea was Mr. Sam Brook, now retired, who assisted in the installation of the initial plant at the electricity works and who is believed to be the only original workman still surviving. The gathering also included the Mayor (Alderman J. E. Lunn), Mr. V. A. Pask (manager, C.E.B. Mid-East England Area) and Mr. F. A. Ellis (deputy electrical engineer) who is to succeed Mr. Lunn.

In the course of the speeches Mr. Pask congratulated the Corporation on the success of the undertaking and paid a tribute to Mr. Lunn, whom he described as a sound engineer with a thorough commercial instinct. Alderman Barlow considered that the next few years would bring developments of which they had no conception.

A letter was read from Mr. J. W. Turner expressing regret at not being able to attend.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Dubilier Condenser Co. (1925), Ltd., reports a trading profit to March 31st (after providing for E.P.T.) of £44,431, as compared with £43,923 for the previous year. Royalties and other income make the total £51,177. Income tax requires £21,000, depreciation £7,052, directors' fees and additional remuneration £1,563, and cost of patents and renewals £568, leaving a net profit of £20,994 (against £12,067). The ordinary dividend for the year is maintained at 10 per cent. £10,000 is allocated to war contingency reserve, and the balance carried forward is £18,841 (against £16,695 brought in).

Lisbon Electric Tramways, Ltd., reports a credit balance on profit and loss account for 1942 of £58,948, after the transfer of £55,000 to general reserve. The dividend is maintained at 5 per cent. by a final payment of 2½ per cent.

The East African Power & Lighting Co., Ltd., reports a net revenue (before meeting taxation) of £155,220, against £142,626 for 1941. The dividend is maintained at 7 per cent. by a final distribution of 4 per cent.

Crossley Bros., Ltd., are paying a dividend of 5 per cent. (same) on the deferred ordinary shares. The net profit (after providing for taxation, etc.) rose from £76,456 to £111,883.

Crossley-Premier Engines, Ltd., reports a net profit (after meeting taxation) of £18,264 for 1942-43. The ordinary dividend is unchanged at 10 per cent.

Gabriel, Wade and English, Ltd., increased their net profit from £74,735 to £86,357 and are maintaining the ordinary dividend at 6 per cent., with 4 per cent. bonus.

Waste Heat & Gas Electrical Generating Stations, Ltd.—The interim dividend is 2½ per cent. (same).

Falk, Stadelmann & Co., Ltd., have declared a dividend of 7½ per cent. for the past year (same).

Thorn Electrical Industries, Ltd., are again paying an ordinary dividend of 20 per cent.

Waygood-Otis, Ltd., are again paying an interim dividend of 10 per cent.

Companies' Returns

Statements of Capital

Crompton Parkinson, Ltd.—Capital, £2,000,000 in £200,000 first preference stock and shares of £1, £500,000 second preference stock, £150,000 ordinary stock and £1,150,000 "A" ordinary stock and shares of 5s. Return dated January 4th, 1943. £170,725 first preference, £500,000 second preference, £150,000 ordinary and £1,111,519 10s. "A" ordinary stock fully paid up. Mortgages and charges: Nil.

Mann Egerton & Co., Ltd. — Capital, £370,925 1s. in 250,000 preference shares of £1 and 2,418,501 ordinary shares of 1s. Return dated January 4th, 1943. 210,415 preference and 710,721 ordinary shares taken up. £198,920 1s. paid on 191,434 preference and 149,721 ordinary shares. £47,031 considered as paid on 18,981 preference and 561,000 ordinary shares. Mortgages and charges: £36,588.

Autocar Electrical Equipment Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1942 (filed February 22nd, 1943). 4,002 shares taken up. £4,002 paid. Mortgages and charges: Nil. A further two shares were allotted for cash on May 21st, 1943.

Mortgages and Charges

North-Eastern Electric Supply Co., Ltd.—Satisfaction (1) to the further extent of £27,881 on June 15th, 1943, of trust deed dated August 1st, 1935, and registered August 13th, 1935, securing £1,500,000 3½ per cent. consolidated debenture stock and (2) to the extent of £26,724 on July 3rd, 1943, of trust deed dated April 22nd, 1942, and registered May 6th, 1942, securing £2,202,039 3¾ per cent. consolidated debenture stock.

Milliwatt, Ltd.—Satisfaction (1) to the extent of £150 on March 24th, 1943, of debentures authorised November 8th, 1937, and registered November 29th, 1937, and (2) to the extent of £50 on same date of debentures authorised July 13th, 1939, and registered August 15th, 1939. (Notices filed July 28th, 1943.)

R. J. Kemp & Co., Ltd.—Equitable assignment of contract moneys, dated July 10th, 1943, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £6,000.

Parkes & Upperton, Ltd.—Debenture dated July 7th, 1943, to secure £800, charged on the company's property, present and future, including uncalled capital. Holder: E. Burkitt, Hove.

British Radio Corporation, Ltd.—Satisfaction in full on July 13th, 1943, of two debentures for £50 each, dated November 1st, 1941, and registered November 8th, 1941.

Increase of Capital

Halsey's Electrical Co., Ltd.—The nominal capital has been increased by the addition of £4,000, in £1 ordinary shares, beyond the registered capital of £1,000.

Companies to be Struck Off Register

The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary: Evendrawn Electric Lamp and Accessories Co., Ltd.; Monnier (Electrical), Ltd.

Liquidations

Lomax & Samways, Ltd.—Particulars of claims by August 20th to the liquidator, Mr. H. Titterton, 79A, Wellington Road South, Stockport. This notice is purely formal. All creditors have been, or will be, paid in full.

STOCKS AND SHARES

TUESDAY EVENING.

FOR the middle of August, the volume of Stock Exchange business keeps up remarkably well. Prices fluctuate narrowly except in the case of a few issues to which speculative attention is more particularly attracted at the moment. Investment securities not only hold their ground but, on balance, make further headway. The Home railway market, in spite (or because, perhaps) of bitter criticisms from people who think that the Government should modify the bargain made with the railways four years ago, attracts sufficient money to keep prices of its stock on the upgrade. Transport "C" has taken a big jump. In the industrial group, such shares as British Insulated, Callender's, General Electrics and similar descriptions are the subject of steady buying pressure. In the radio list, Electric & Musical Industries shares continue a centre of activity.

Home Rails Revive

Home railway junior stocks are decidedly better. The chief gainer is London Passenger Transport "C", which has put on 5½ points, rising to 70. Southern 5 per cent. preferred is 1 higher at 76. The handsome yields offered by the junior stocks are at length making their influence felt. Nevertheless, every week brings fresh testimony to the resentment felt by stockholders at the refusal of the Government to amend the agreement entered into with the companies soon after the outbreak of war. Under this agreement, a fixed revenue was accorded to the companies by the Government. Of late, the revenues of the railways have so greatly increased over and above the guaranteed amount that some of the holders of the ordinary stocks have begun to agitate for more generous treatment and higher dividends.

On the other hand, to quote the fundamental rule upon which the Stock Exchange is established, unwritten though that rule be, a bargain is a bargain, and must be scrupulously observed by both parties to it.

Ward & Goldstone

The net profits of Ward & Goldstone for the year recently ended are £11,600 less than those in the previous year. This, as reported here last week, is due to increased taxation and provision for reserves. Thanks to the prudent financial policy pursued in the past, the dividend of 20 per cent. on the ordinary shares is maintained. This rate has been paid since 1938 onwards. In 1939, the company made a capital bonus issue of 10 per cent. The company, registered 24 years ago, has a capital of £200,000, of which there is issued £80,000 in 7 per cent. preference shares of £1 each and £94,367 in ordinary shares of 5s. each. The conservative character of the dividend policy is best illustrated by the fact that for the year ended March 31st, 1942, the dividend of 20 per cent. was paid out of earnings of 79 per cent. while in 1941 the earnings on the ordinary were 70 per cent. against 65 per cent. in the previous year. The yield on the shares at the present price of 23s. 9d. is £4 4s. 2d. per cent.

Price Fluctuations

Bournemouth & Poole ordinary at 57s. are 6d. better, and not another change has occurred in the list of electricity supply companies' shares. City "Lights" show no recovery from their last week's decline of a florin, induced by the non-payment of an interim dividend. The improvements scored a week ago by the Indian electricity companies have been retained. Dollar stocks are mostly lower. Shawinigan Water has receded to 19½. Brazilian Tractions fell back to 29¼. The success of the Allies and, as a consequence, the possible shortening of the war in Europe, led to a shake-out of prices in the New York Stock Exchange, and the fall was not wholly regained.

Equipment & Manufacturing

British Insulated, Callender's and Henley's are all better, the first-named being 5⅜. Callender's still offer the best yield of the trio, on the basis that is to say, of the present-paid dividends. British Aluminium shares strengthened to 49s. Hopkinsons are 9d. up at 64s. 6d. A rise of 1s. 9d. carried Revo to 38s. 9d. Johnson & Phillips at 69s. 6d. are the pence harder. Enfield Cables at 58s. 6d. are similarly better. After touching 28s. the price of Electric & Musical Industries eased off to 27s. 6d. which left a rise of 6d. on the week. E. K. Cole have been a lively spot, with a similar advance to 25s. 6d. Pye deferred hold their gain at 25s. Cossor kept close to 24s. and Philco went back a trifle, to 12s. 3d.

Ferranti

Ferranti, Ltd., announced last month that the board considered it advisable to increase the borrowing powers of the company, in order to cope with the continued development of the business. At an extraordinary meeting, held on July 15th, the directors were authorised to increase the company's borrowing powers to £3,000,000. The money is wanted, the directors state, for current requirements, and not for capital expenditure. Three new directors have recently been appointed.

Subsidiary companies operate in Canada and the United States. The ordinary shares,

(*Continued on page* 221)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Aug. 10	Rise or Fall	Yield p.c.
Home Electricity Companies					£ s. d.
Bournemouth and Poole	12½	12½	57/–	+6d.	4 7 10
British Power and Light	6	7	31/–	..	4 10 4
City of London	7	7	27/6	..	5 1 10
Clyde Valley	8	8	39/–	..	4 2 0
County of London	8	8	39/–	..	4 2 0
Edmundson's:					
7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	28/6	..	4 4 3
Elec.Dis.Yorkshire	9	9	44/–	..	4 1 10
Elec. Fin. and Securities	12½	12½	52/–	..	4 16 1
Elec. Supply Corporation	10	10	46/–	..	4 7 0
Isle of Thanet	Nil	Nil	17/–	..	—
Lancs. Light and Power	7½	7½	34/6	..	4 7 0
Llanelly Elec.	5½	6	25/6	..	4 14 1
Lond.Assoc.Electric	4	3	22/–	..	2 14 10
London Electric	6	6	26/6	..	4 10 7
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	39/6	..	4 1 0
Midland Counties	8	8	38/6	..	4 3 1
Mid. Elec. Power	9	9	42/6	..	4 4 9
Newcastle Elec.	7	7	31/–	..	4 10 5
North Eastern Elec.:					
Ordinary	7	7	32/–	..	4 7 6
7% Pref.	7	7	34/–	..	4 2 4
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	10	..	—
Northmet Power:					
Ordinary	7	7	36/6	..	3 16 8
6% Pref.	6	6	30/6	..	3 18 8
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	37/6	..	4 5 4
Southern Areas	5	5	22/–	..	4 10 11
South London	7	7	26/–	..	5 7 8
West Devon	5	5	23/–	..	4 7 0
West Glos.	4½	3½	23/6	..	2 19 7
Yorkshire Elec.	8	8	39/6	..	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/6	..	—
Calcutta Elec.	7*	6*	38/6	..	3 2 4
Cawnpore Elec.	10	10	34/6	..	5 16 0
East African Power	7	7	33/6	..	4 3 7
Jerusalem Elec.	7	5	29/–	..	3 9 0
Kalgoorlie (10/–)	5	5	9/6	..	5 5 3
Madras Elec.	6*	4*	25/–	..	—
Montreal Power	1½	1½	29	..	5 3 5
Palestine Elec."A"	4*	5*	42/–	..	2 7 8
Perak Hydro-elec.	6	7	9/6	..	—
Shawinigan Power	83cts.	90cts.	19½	+½	—
Tokyo Elec. 6%	6	6	22	..	—
Victoria Falls Power	15	15	4½	..	3 10 7
Whitehall Inv. Pref.	—	—	25/–	..	4 0 0

Company	Dividend Previous	Dividend Last	Middle Price Aug. 10	Rise or Fall	Yield p.c.
Public Boards					£ s. d.
Central Electricity:					
1955–60 (Civil Defence)	—	3	99½xd	..	3 0 4
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	102	..	3 8 8
1974–94	3½	3½	100	..	3 5 0
London Elec. Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	110	..	4 1 10
Lond.Pass.Trans.:					
A	4½	4½	117½	..	3 16 7
B	5	5	115½	..	4 6 7
C	2¾	3	70	+5½	4 5 9
WestMidlandsJ.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	116½	..	5 3 0
Def.	1½	1½	29	..	5 3 5
Anglo-Portuguese	8	8	24/–	..	6 13 4
Cable & Wireless:					
5½ Pref.	5½	5½	115	..	4 15 8
Ord.	4	4	78	+½	5 2 8
CanadianMarconi$1	Nil	4cts.	9/6	..	—
Globe Tel. & Tel.:					
Ord.	8½*	5*	36/–	..	2 15 7
Pref.	6	6	29/–	–3d.	4 2 9
Great Northern Tel. (£10)	Nil	Nil	24½	..	—
Inter. Tel. & Tel.	Nil	Nil	17	..	—
Marconi-Marine	7½	7½	31/9	..	4 14 4
Oriental Tel. Ord.	16	10	43/–	..	—
Telephone Props.	6	Nil	14/6	..	—
Tele.Rentals (5/–)	10	10	11/–	..	4 11 0
Traction and Transport					
Anglo-Arg. Trans.:					
First Pref. (£5)	Nil	Nil	4/–	..	—
4% Inc.	Nil	Nil	10	..	—
Brit.Elec.Traction:					
Def. Ord.	45	45	1075	..	4 3 9
Pref. Ord.	8	8	175	..	4 11 5
Bristol Trams	10	10	50/–xd	..	4 0 0
Brazil Traction	$½	$1	29½	–¾	—
Calcutta Trams.	8	5½	41/9	..	2 12 6
Cape Elec. Trams	5	6	25/6	..	4 14 0
Lancs. Transport	10	10	44/3	..	4 10 4
Mexican Light:					
1st Bonds	5	5	107½xd	..	4 13 0
Rio 5% Bonds	5	5	104½	..	4 15 9
Southern Rly.:					
5% Prefd.	5	5	76	..	6 11 7
5% Pref.	5	5	111	..	4 10 0
T. Tilling	10	10	54/–	..	3 14 0
West Riding	10	10	43/6	..	4 12 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Aug. 10	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord...	7½	10	42/6	..	4 14 0
Assoc. Elec. :					
Ord.	10	10	48/6	..	4 2 2
Pref.	8	8	38/–	..	4 4 3
AutomaticTel.&Tel.	12½	12½	57/–	..	4 7 9
Babcock & Wilcox	11	11	48/3	..	4 11 5
British Aluminium	10	10	49/–	+6d.	4 1 6
British Insul. Ord.	20	20	5¼	+⅛	3 14 6
British Thermostat (5/–)	18½	18½	18/6	..	5 0 0
British Vac.Cleaner (5/–)	15	30	27/6	..	5 9 1
Brush Ord. (5/–)	6	8	8/3	..	5 0 0
Burco (5/–) ..	15	15	14/3	..	5 5 1
Callender's ..	15	20	98/–	+1/–	4 1 8
ChlorideElec.Storage	15	15	82/6	..	3 13 0
Cole, E. K. (5/–)	7	10	25/6	+6d.	1 19 2
Consolidated Signal	17	24	5⅞	..	4 8 3
Cossor, A. C. (5/–)	15	10*	24/–	..	1 11 3
Crabtree (10/–) ..	17½	17½	38/–	..	4 12 4
Crompton Parkinson Ord. (5/–) ..	20	20	26/–	..	3 17 0
E.M.I. (10/–) ..	6	6	27/6	+6d.	2 3 8
Elec. Construction	10	12½	47/6	..	5 5 3
Enfield Cable Ord.	12½	12½	58/6	+6d.	4 5 6
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric	10	10	48/–	..	4 3 4
Ensign Lamps (5/–)	25	25	21/3	..	5 17 8
Ericsson Tel. (5/–)	22†	20†	47/6	..	2 2 2
Ever Ready (5/–)	40	40	38/6	..	5 4 0
Falk Stadelmann	7½	7½	31/6	..	4 15 3
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C. : Pref. ..	6½	6½	32/–	..	4 1 3
„ Ord. ..	17½	17½	89/–	..	3 18 8
Greenwood&Batley	15	15	38/6	..	7 15 10
HallTelephone(10/–)	12½	12½	25/3	..	4 19 0
Henley's (5/–) ..	20	20	26/–	+3d.	3 17 0
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	17½	64/6	+9d.	5 8 6
India Rubber Pref.	5½	5½	21/–	..	5 4 9
Intl. Combustion	30	30	6½	..	4 17 10
Johnson & Phillips	15	15	69/6	+6d.	4 7 2
Lancashire Dynamo	20	22½	92/9	..	4 17 0
Laurence, Scott (5/–)	15	12½	12/–	..	5 4 2
London Elec. Wire	7½	7½	31/6	..	4 15 3
Mather & Platt ..	10	10	49/–	..	4 1 8
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5½	..	3 16 0
Pye Deferred (5/–)	25	25	25/–	..	5 0 0
Revo (10/–) ..	17½	17½	38/9	+1/9	4 10 3
Reyrolle.. ..	12½	12½	67/6	..	3 14 0
Siemens Ord. ..	7½	7½	32/3	..	4 13 0
Strand Elec. (5/–)	4	7½	7/3	..	5 3 5
Switchgear & Cowans (5/–) ..	10	20	15/6	..	6 9 0
T.C.C. (10/–) ..	5	5	18/9	..	2 13 4
T.C. & M. ..	10	10	52/–	..	3 17 1
TelephoneMfg.(5/–)	9	9	12/–	..	3 15 0
Thorn Elec. (5/–)	20	20	21/6	..	4 13 1
Tube Investments	20	20	91/–	..	4 8 1
Vactric (5/–) ..	Nil	Nil	14/6	+6d.	—
Vickers (10/–) ..	10	10	19/6	..	5 2 7
WalsallConduits(4/–)	55	55	43/6	..	5 1 2
Ward & Goldstone (5/–)	20	20	23/9	..	4 4 2
WestinghouseBrake	10	12½	65/–	+1/8	4 0 0
West, Allen (5/–)	7½	7½	7/6	..	5 0 0

* 5 per cent. tax-free.

† Dividends free of Income Tax.

Stocks and Shares (*Continued from page* 219)

of which there are issued 600,000 of 10s. each, are privately held. The 7 per cent. preference quoted in our weekly list are a sound security, there being ample margin of earnings cover beyond the amount required for payment of the preference dividend. The present price is 28s. 9d. at which the return on the money comes to £4 17s. 5d. per cent.; the dividends are payable on January 1st and July 1st. For more than 10 years the ordinary shares have annually received 6 per cent. dividend—free of tax in the past four years.

Electrical Finance & Securities

As mentioned last week, the Electrical Finance & Securities Co. has given notice to the holders of its 5½ per cent. debenture stock of its intention to convert the outstanding £270,247 stock into a new 4 per cent. debenture, to take place on February 1st next. Holders will be offered either cash or conversion, at par, into the new 4 per cent. debenture 1946-75 which is to be issued on the 19th of the present month. The stock has been quoted for some time past in the market at about 100. The Electrical Finance & Securities Co. was formed about 30 years ago to finance and develop electricity undertakings; it owns shares in supply companies in different parts of the country. The present proposal to repay, or convert the 5½ per cent. debenture stock is the latest example of the modern readiness to take advantage of conditions that, as things have turned out, enable a company to reduce its fixed charges when the opportunity to do so is presented.

Thomas de la Rue

The remarkable recovery in the fortunes of Thomas de la Rue which resulted in a dividend of 35 per cent. being paid for 15 months as against nil for the previous twelvemonth, is ascribed mainly to the development of the plastics side of the company's business. For the past few weeks, plastics has been a word with which to conjure, and the name of Thomas de la Rue has been linked by a rumour—promptly and officially denied—with that of Courtaulds as possible co-operators in the industry. The price of de la Rue shares is a little easier on the week at 7 11/16.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

J. C. ARNOLD (W. S. Tyler Co.).—"Control system for the frequency reduction of alternating electric current." 10237. July 22nd, 1942. (554805.) "Electron tube control circuit for frequency conversion." 10771. July 31st, 1942. (554808.)

Babcock & Wilcox, Ltd.—"Tubulous vapour generators." 916/42. April 26th, 1941. (554927.)

British Insulated Cables, Ltd., G. H. Walton, J. C. Quayle and P. Jones.—"Heat treatment of the insulating coverings of electric wires and cables." 5191. April 18th, 1942. (554854.)

British Mechanical Productions, Ltd., and S. T. Deakin.—"Snap-action electric switches." 951. January 22nd, 1942. (554934.)

British Thomson-Houston Co., Ltd.—"Refrigerant evaporators." 10764/42. August 1st, 1941. (554807.) "Selenium rectifiers." 17573/42. December 18th, 1941. (554822.) "Frequency variation response network." 660/42. January 17th, 1941. (554836.) "Protective systems of the distance type for electric circuits." 803/42. January 21st, 1941. (554868.) "Glass lehrs." 1760/42. February 10th, 1941. (554899.) "Resinous moulding compositions." 15848/41. December 10th, 1940. (554923.) "High-voltage electric circuit-breakers." 981/42. January 27th, 1941. (554936.)

British Thomson-Houston Co., Ltd., and J. H. Walker.—"Heteropolar inductor alternators." 14710. November 15th, 1941. (554827.)

British Thomson-Houston Co., Ltd., C. W. Wood and H. E. G. Watts.—"Electric lampholders." 1051. January 26th, 1942. (554843.)

Callender's Cable & Construction Co., Ltd., and H. Shuttleworth.—"Electric cable joints." 4303. March 31st, 1942. (554852.)

Creed & Co., Ltd.—"System and apparatus for facsimile telegraphy." 973/42. April 18th, 1941. (554935.)

Electroflo Meters Co., Ltd., and L. C. Pike.—"Measuring, indicating or recording instruments." 6018. May 5th, 1942. (554906.)

Elektriska Svetsnings-Aktiebolaget, and E. E. V. Helin.—"Coated welding electrodes." 3475. March 16th, 1942. (554804.)

English Electric Co., Ltd., and H. Dolan.—"Depth indicators for mine cages and in similar position indicators." 945. January 22nd, 1942. (554871.)

General Electric Co., Ltd., and G. T. Thompson.—"Frequency modulators for electric signalling." 8531. June 22nd, 1942. (554887.)

Geophysical Prospecting Co., Ltd., J. C. Templeton and L. T. Winkler.—"Electrical apparatus for the analysis or identification of gases, vapours and the like." 13347. October 16th, 1941. (554792.)

J. W. Gillie.—"Daylight signalling lamp." 5565. April 25th, 1942. (554902.)

J. A. Henley and Metropolitan-Vickers Electrical Co., Ltd.—"Air or gas blast electric switches." 722. January 17th, 1942. (554839.)

Kolster-Brandes, Ltd., and D. N. Corfield.—"Variable electric condensers." 663. January 16th, 1942. (554801.)

Linde Air Products Co.—"Electric welding and fluxes therefor." 1851/42. March 21st, 1941. (554846.)

C. G. Mayo.—"Alternating current bridge circuits." 896. January 21st, 1942. (554896.)

A. S. Milinowski, jun.—"Electrotherapy." 3612. March 18th, 1942. (554848.)

S. R. Mullard and C. F. M. Hayes.—"Dry cells or batteries." 647. January 16th, 1942. (554926.)

N. Pensabene. — "Dynamo - electric machines." 7851. June 9th, 1942. (Addition to 490062.) (554915.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Electric discharge tubes having a directional electron beam." 14786. November 17th, 1941. (554828.)

H. B. Prentice.—"Riveting of electrical conducting joints." 9334. July 6th, 1942. (554919.)

J. H. Runbaken.—"Chargers for electric accumulators." 4012. March 26th, 1942. (554901.)

Standard Telephones & Cables, Ltd.—"Application of frequency dividers to the reception of signal modulated electric carrier waves." 7456/42. April 24th, 1941. (554914.)

Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.).—"Electric alternating-current signalling systems." 10527. July 28th, 1942. (554806.) "Electron discharge apparatus." 4173. March 28th, 1942. (554851.) "Two-way signal transmission system." 6548. May 14th, 1942. (554911.)

A. H. Stevens (Electronic Laboratories, Inc.).—"Illuminating or signalling devices." 3624. March 18th, 1942. (554849.)

A. A. Thornton (Brown Fintube Co.).—"Apparatus for making finned tubes by resistance welding." 12102. August 27th, 1942. (554813.)

Western Electric Co., Inc.—"Sound film reproducing systems." 12640/42. September 24th, 1941. (554817.)

Westinghouse Brake & Signal Co., Ltd., L. E. Thompson and A. Jenkins.—"Manufacture of alternating current rectifiers of the selenium type." 870. January 21st, 1942. (554892.) "Manufacture of alternating-current rectifiers of the selenium type." 871. January 21st, 1942. (554893.) "Manufacture of alternating-current rectifiers of the selenium type." 872. January 21st, 1942. (554894.)

Westinghouse Electric International Co.—"Refrigeration apparatus." 7429/42. May 7th, 1941. (554885.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—NEW SOUTH WALES.—October 27th: Sydney County Council. Steam generating plant, Pyrmont power station (Section B); Specification 650. 50,000-kW steam turbo-alternator; Specification 651.

Orders Placed

Barrow-in-Furness.—Electricity Committee. Accepted. Automatic boiler control.—James Gordon & Co.

Durham. — County Finance Committee. Accepted. Lamps for twelve months.—Luxram Electric.

Glasgow.—Transport Committee. Accepted. Gear wheel rims.—British Thomson-Houston Co. Tram rails.—Cargo Fleet Iron Co. Motor axle bushes.—Anti-Attrition Metal Co. Pinions for tram motors.—A. Wiseman & Co.

Kent.—County Emergency Committee. Accepted. Electrical work : Blean depot (£139).—Court Bros. Coxheath depot (£117).—Hedley Brown. Lyminge depot (£128).—Folkestone Electricity Supply Co.

London.—Metropolitan Water Board. Works Committee. Accepted. Electric lamps.—E. K. Cole. Two rotor control gears for electric pumping plant at Lee Bridge (£164).—Allen West & Co. Laying on electricity supply at Orpington works (£77).—West Kent Electric Co. Rectifying set for Lee Bridge (£233).—Electric Construction Co. Switchboard for Lee Bridge (£83).—City Electrical Co.

Ossett. — Library Committee. Accepted. Electric light alterations at library.—A. M. Bitcliffe.

Middlesex.—County Health Committee. Accepted. X-ray apparatus for Finchley clinic (£1,143).—Watson & Sons.

Southport.—Electricity Committee. Accepted. Transformers for twelve months.—Electric Construction Co.

Warrington.—Electricity Committee. Accepted. L.v. cables.—B.I. Cables, Ltd.

West Hartlepool.—Corporation. Accepted. Refrigerator for British Restaurant (£264).—Frigidaire.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ardwick.—Office and workshop, Limekiln Lane; T. Marden & Son, Ltd., builders, Limekiln Lane.

Ashbourne.—Farm workers' houses (14) for R.D.C.; Fryer, Ltd., builders, Great Northern Road, Derby.

Backworth.—Canteen at the Bates pit; R. Burke, Singleton House, Northumberland Road, Newcastle.

Bailiffe Bridge.—Houses; J. Jagger & Sons, Ltd., builders, Glenwood, Fixby Road, Fixby, Huddersfield.

Blean (Kent).—Feeding depot (£2,352); W. W. Martin.

Bolton.—Alterations, Pilkington Street; James Baxendale & Sons, Ltd.

Boston—Houses (16) for R.D.C.; Trent Building Co., Ltd.

Bournemouth.—Additions, 61-71, Palmerston Road; M. & P. Dairies, Ltd.

Cardiff.—Youth club, Rhoose, and holiday centre, Glanmorfa Rhyl; Welsh National Council of Y.M.C.A.

Chatham.—Erection of wartime nursery in Maida Road, Luton; R. L. Honey, borough architect, Town Hall.

Colwyn.—Houses (£4,186) for R.D.C.; J. L. Griffiths, builder, Tremont Road, Llandrindod Wells.

Coventry.—Reconstruction of science block and workshop and new extensions to King Henry VIII Grammar School; governors.

Temporary school, Keresley Grange (£12,140); D. E. E. Gibson, M.A., city architect, 1a, Warwick Row.

Coxheath (Kent).—Feeding depot (£1,882); J. A. Davidson & Son.

Cumberland.—Increased accommodation at police courts; county architect, 4, Alfred Street North, Carlisle.

Darlington.—Store, Dodsworth Street, for the Darlington Wire Mills, Ltd.

Daventry.—Houses for agricultural workers for R.D.C.; Bosworth & Wakefield, Ltd., builders, New Street.

Devizes.—Houses (£7,523), Bishops Cannings and Stanton St. Bernard, for R.D.C.; F. Rendell & Sons, builders, St. John Street, Devizes.

Dundee.—Dairy at Gourdie Farm for Corporation; city architect.

Durham.—Additional nursery school at Hebburn, to accommodate 80 children; county surveyor, 43, Old Elvet, Durham.

Easingwold (Yorks.).—Houses (12); F. Pilkington, builders, Pannal Ash, Harrogate.

Falmouth.—Shelters at elementary schools (£1,000); borough surveyor, Municipal Buildings

Fulwood.—Catholic Church, Marlborough Drive; Bishop of Lancaster, Bishop's House, Cannons Hill, Lancaster.

Hamilton.—British Restaurant and cooking depot (£3,261); burgh surveyor.

Hereford.—Additions, Friar Street flour mills, for Watkins Bros.; Beavan & Hodges.

Works reconstruction; C. Corey.

Office additions; Painter Bros., Ltd.

Hinckley.—British Restaurant, Barwell, for

U.D.C.; J. S. Featherston, surveyor, Council Offices, Station Road.

Hull.—Eight wartime nurseries; city engineer.

Huntingdon.—Houses (£9,401), Great Gidding, Sawtry and Spaldwick, for R.D.C.; M. J. Allen & Sons, builders, Brampton.

Ilkeston.—Nursery, Sudbury Park (£2,500); borough engineer.

Kilmarnock (Ayrshire).—Garage and house (£1,200) for Ayrshire Coalowners' Association, Ayr; secretary.

Lancashire.—Additions and equipment as extensions to Upholland Grammar School; L. Evans, county architect, County Buildings, Fishergate Hill, Preston.

Leeds.—Additions and alterations at St. Mary's Infirmary, Greenhill Road; H. R. Hudson, superintendent of works, 123, Beckett Street, Leeds, 9.

Leyburn.—Houses for farm workers; Moody Bros., builders, Northallerton.

London.—WANDSWORTH.—Extensions, 27, Tooting Bec Road, Balham; Durnford & Moore. Administrative offices, 65, Putney Bridge Road, Southfield; Hunter & Clark, Ltd.

Lyminge (Kent).—Feeding depot (£2,149); S. J. Sharp & Son (Hythe), Ltd.

Malmesbury.—Houses (£7,865), Burton Hill, Foxley, Minety and Charlton, for R.D.C.; Holborow & Sons, Ltd., builders, Tetbury, Gloucestershire.

Manchester.—Day nurseries: Briscoe Lane, Newton Heath; Musker Bros., Ltd., builders, Bingham Street, Swinton. Union Street, Ardwick; A. D. Primrose, Swan Joinery Works, Halliwell Road, Bolton.

Girls' remand home, Alder House, Whalley Range; A. H. Prosser, builder, 17a, Monton Street, Manchester, 15.

Mansfield.—Office, King's Mill Lane; J. A. Taylor.

Marlborough and Ramsbury.—Houses (£9,716), Mildenhall, Fyfield and East Grafton, for R.D.C.; T. J. Gough, Ltd., builders, Shakespeare House, Uxbridge Road, Hayes, Middlesex.

Middlesex.—Additions, County Hospital, Hillingdon (£1,508); county architect.

Middleton.—Wartime day nursery at Sunny Brow, Archer Park, Rhodes; H. Green & Sons, builders, Stocks House, Manchester, 8.

Montgomeryshire. — Kitchen, Guilsfield School; T. Glyn Davies, director of education, County Education Offices, Newtown.

Newcastle (Staffs.)—Offices; Automatic Remote Control, Ltd., Dragon Square, Chesterton.

Nidderdale.—Houses (£6,344), Aldborough and Ferrensby, for R.D.C.; W. H. Young (Ackworth), Ltd., builders, Wakefield Road, Ackworth, Pontefract.

Northumberland.—A.P.R. rescue depot at Ashington and additions to decontamination laundry at Berwick; county architect, County Hall, Newcastle-on-Tyne.

Agricultural workers' houses at Netherwitton and Longhorsley; Mauchlen & Weightman, 12, Saville Row, Newcastle-on-Tyne.

Oakham.—Extensions to Oakham School, Deanscroft estate; governors.

Ormskirk.—Fire station, Tarleton; Regional Officer, National Fire Service, Ormskirk.

Romsey. — Houses (£5,700), Wallop, for R.D.C.; Butter Bros. (Southampton), Ltd., builders, Braishfield.

Rowley Regis.—School kitchen at Old Hill Masefield School; Pritchard, Godwin & Clist, architects, Bank Buildings, Kidderminster.

Rushden.—British Restaurant (£1,400), High Street, for U.D.C.; J. W. Lloyd, surveyor, Council Buildings.

St. Neots.—Houses (£5,389), Waresley and Catworth, for R.D.C.; Winton-Hayes, Ltd., builders, Biggleswade.

Southam.—Houses (£11,299), for R.D.C.; Lewis & Watters, builders, Lime Avenue, Leamington.

South Kesteven.—Houses for farm workers; G. A. Thurston & Sons, builders, Knight Street, Pinchbeck.

South Shields.—Restoration of St. Bede's R.C. Senior School (£1,000); Page, Son & Bradbury, architects, King Street.

South Westmorland.—Houses for the North-Eastern Housing Association; Nicholson & Wright, builders, Lancaster.

Spalding.—Houses (£5,167), Moulton and Tongue End, for R.D.C.; G. Barnsdale & Sons, builders, Donington.

Stokesley.—Houses for farm workers (12) for the R.D.C. Contractors (four houses each):—Cowan & Son, Stockton; Stephen Coates, Ltd., Middlesbrough; and Doughtly, Ltd., Yarm.

Sturminster.—Agricultural cottages (£3,640), for R.D.C.; S. M. Mulley, Ltd., Purewell Building Works, Christchurch, Hants.

Sunderland.—Wartime nursery, Thompson Park; J. E. Lewis, borough engineer, Town Hall.

Totnes. —Houses (£15,850), for R.D.C.; Coombe & Son, builders, Paignton.

Trimdon Grange.—Miners' canteen; R. Burke, Singleton House, Northumberland Road, Newcastle-on-Tyne.

Wallsend.—School, High Farm; borough engineer.

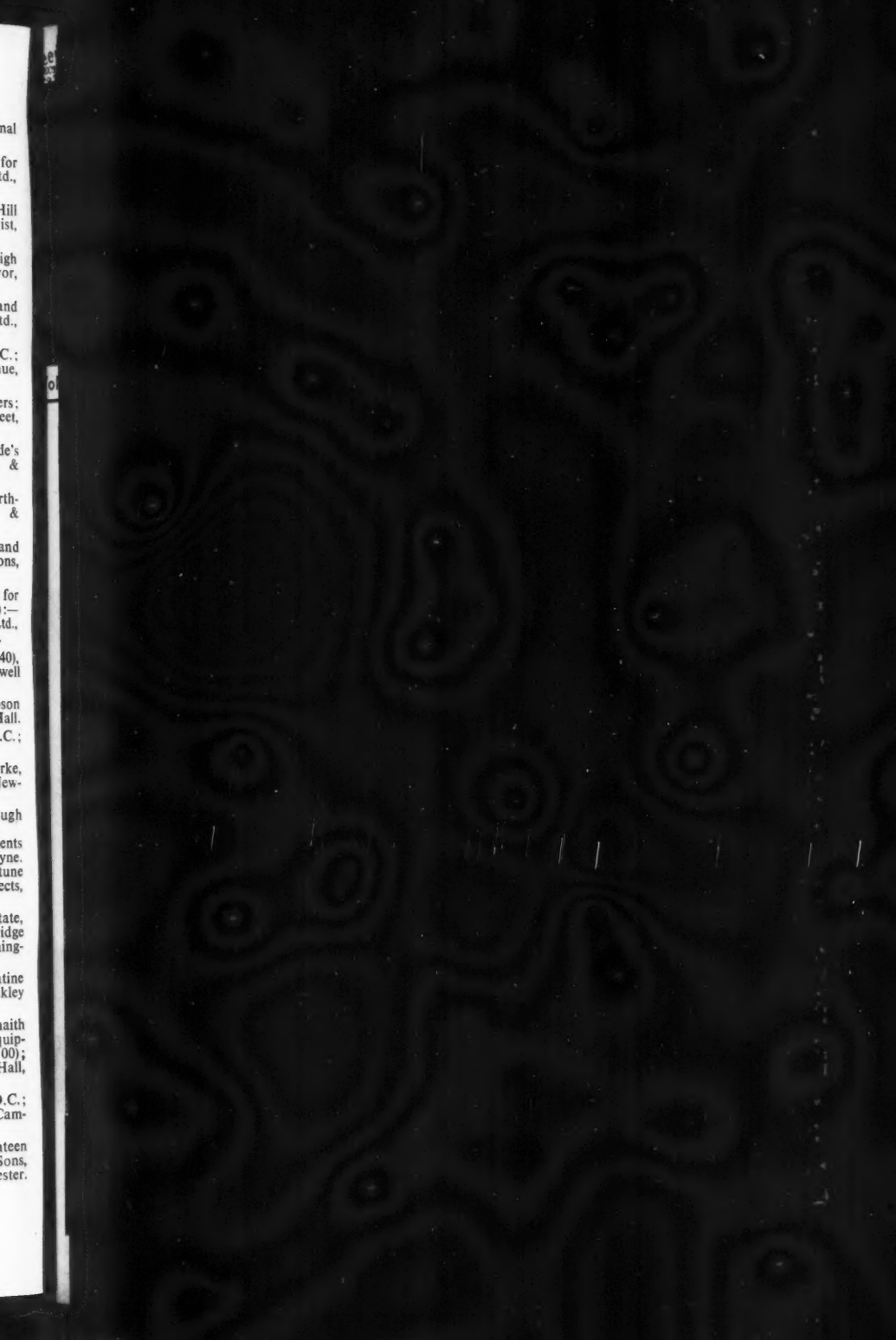
Two wartime nurseries (£5,337); T. Clements & Sons, builders, Jesmond, Newcastle-on-Tyne.

Additional storey at canteen, Neptune Road; L. J. Couves & Partners, architects, Carliol House, Newcastle-on-Tyne.

Wellington.—Village Hall, Donnington estate, for R.D.C.; J. B. Cooper, architect, Coleridge Chambers, 177, Corporation Street, Birmingham, 4.

West Lancashire.—Houses (12); Palatine Construction Co., Ltd., builders, 9a, Winckley Square, Preston.

West Riding.—Cooking depot at Snaith (electrical work) and dining room and equipment at Bingley Grammar School (£1,100); A. Booth, county architect, County Hall, Wakefield.

Winslow.—Houses (£5,123) for U.D.C.; Webster & Cannon, Ltd., builders, 42, Cambridge Street, Aylesbury.

Worcestershire. — Extensions to canteen kitchens and feeding services; H. Rowe & Sons, county architects, 38, Foregate Street, Worcester.